ENGINEERING NEWS

A JOURNAL OF CIVIL, MECHANICAL, MINING AND ELECTRICAL ENGINEERING

Vol. 60. No. 9. 220 Broadway, New York, August 27, 1908.

TABLE OF CONTENTS.

	Page.
LEADING ARTICLES:	
Conservatory Buildings of Steel Construction in Garfield Park, Chicago (illustrated)	217
The By-Product Coke-Oven; William Hutton Blauvelt, M. Am. Soc. M. E.	218
A 160-Mile Pipe Line Water Distribution System on the El Paso & Southwestern Ry. (illustrated)	223
Maintenance Records of Pooled Equipment; Boston Elevated Ry. Co.; H. S. Knowlton	228
A Large Reinforced-Concrete Coal Pocket at Charlestown, Mass. (illustrated); George P. Carver, Assoc. M. Am. Soc. C. E.	229
A New Type of Switchboard; For the Salt River Project, U. S. Reclamation Service (illustrated)	231
A New Design of Convertible Stiff-Leg and Guy Derrick (illustrated)	236
The Puech Roughing Filters of the Derwent Valley Water Board, England (illustrated)	236
A Novel Highway Bridge (illustrated); F. M. Goodhue	237
The Volatile Matter of Coal as Evolved Under Different Conditions; Horace C. Porter and F. K. Ovitz	238
An Example of the Decomposition of Concrete in Sea Water	238
Notes from the Engineering Schools	238
EDITORIAL	233
Car Speeds and Traffic Capacity in Philadelphia—The Growth of Centralized Railway Water Supply Systems—The Use of Bran to Stop Leaks and Determine the Velocity in a Long Wood Water Supply Conduit—The Slow Progress of the New York Barge Canal.	
A Curious Phase of the Street Railway Bankruptcy in New York City	234
LETTERS TO THE EDITOR	235
Allowing for Length of Straight Frog Rail in Calculations for Turnouts; James B. Strong, Assoc. M. Am. Soc. C. E., R. Fleming Arnott, D. Hain, O. K. Morgan—Notes and Queries.	
ENGINEERING NEWS OF THE WEEK	239
PERSONALS	240
SOCIETY PROCEEDINGS	240

CONSERVATORY BUILDINGS OF STEEL CONSTRUCTION IN GARFIELD PARK, CHICAGO.

One of the most important improvements made recently by the West Park Commission, of Chicago, is the construction of a large group of conservatory buildings in Garfield Park. These are of steel frame construction and present some interesting features of structural steel work. The palm house, 85 × 250 ft., forms the main front, and has an ornamental entrance. From the rear of this extend two side buildings 50 × 132 ft. These connect with corner buildings 65 × 86 ft., which are connected by another building 50 × 97½ ft. These buildings form a hollow square, and the enclosed space is roofed over to form a central building 112½ × 150 ft. Fig. 1 is a view of the palm house, with the uncompleted entrance lobby enclosed to protect the plaster from freezing.

It was necessary to consider appearance as well as strength in the structural design, and owing to the varying curvature of the roofs of the different buildings, the connections of these buildings involved some rather complicated work. All the buildings forming the square have curved roofs, the design varying with the height and width, and with the special purposes for which the several buildings are designed. The central building has a sloping roof. The calculations and proportioning are based upon a dead load of 10 lbs. per sq. ft., and a wind pressure of 15 lbs. per sq. ft.

FIG. 1. PALM HOUSE IN THE GROUP OF CONSERVATORY BUILDINGS AT GARFIELD PARK, CHICAGO.

The main members of the palm house are arched ribs forming both the side columns and the roof trusses. These are spaced 12 ft. 6 ins. c. to c., and between them are latticed purlins which carry the wooden glazing bars. The upper part of the rib has a slope, and is connected to the vertical side portion by a wide curve. Fig. 2 is a cross section of this building, and shows the stresses in the members. The main ribs are 30 ins. deep over the chords, which are composed of four flange angles 3½ × 5 ins. The web members are angles 2½ × 2½ ins., riveted to the 5-in. legs of the chord angles. Fig. 3 shows the details of this construction. In some of the ribs, however, the flange angles are only 2 × 2½ ins., with connection plates riveted between them for the attachment of the web members. This latter construction is used in the ribs of the two 65-ft. corner buildings, and is shown also in Fig. 5.

The side buildings are only 30 ft. high at the center. Their ribs have four chord angles, with a 6-in. plate in the top chord. The chords are not parallel. The lower chord has an elliptical curve, while the top chord forms a peak or ridge. At the sides the chords are brought close together, and form posts of H section, with a web plate between the vertical angles. Fig. 3 shows some of the details of construction of the ribs, and Fig. 4 is an interior view which gives a good idea of the light and graceful appearance of the steel work. The ribs are only 8 ft. 6 ins. apart, and the purlins are single angles.

From the cross section of the central and side buildings, Fig. 6, it will be seen that the floor of the former is sunk 4 ft. below that of the other buildings, and that its roof is of very different design from the others. This roof has flat slopes of 1 on 2, and is supported by parallel-chord ribs, spaced 12 ft. 6 ins. apart. These are carried by latticed columns at the sides, and by two lines of intermediate columns, forming a central span of 50 ft. and two side spans of 31 ft. each. The columns are of cast iron 7 ins. diameter, and extend up to the top chord. The clear height above the floor is 7 ft. at the side and 31 ft. at the center. Between the web members of the ribs are fitted lattice purlins, and a line of lattice girders is framed between the tops of the columns. Some of the details of the ribs and the purlins are shown in Fig. 3, and Fig. 7 is an interior view.

The rafters are formed by the main ribs in all the buildings. In the palm house, the central building and the two corner buildings, they are spaced 12½ ft. apart and connected by lattice purlins. In the side and rear buildings, they are 8 ft. 6 ins. apart and connected by purlins of single angles. In all cases the rafters have wooden caps 2¾ × 2½ ins. or 2¾ × 2¼ ins., secured to the gutter flanges by iron brackets. The caps are grooved on the sides to catch the condensation water which forms on the glass, and are rabbeted on top to receive the glass. The roof glazing bars, carried by the purlins, are grooved in the same way as the caps. Condensation gutters are fitted at the ventilator headers and the springing lines, with leaders to the floor.

The roofs of the front, rear and central buildings are glazed with 24-in. glass in lengths of 24 ins., while in the other buildings the glass is 16 ins. wide. The glass is ground on the inner or concave side to diffuse the direct rays of the sun. The lights are laid with ¼-in. lap, bedded in greenhouse putty, and each light is secured by galvanized-iron nails. A zinc Z-bar glazing strip is laid where the glass laps the gutters. The glass is bent to fit the various curves of the roofs. The gutters are of copper, and the leaders are carried down inside the buildings.

The specifications for structural steel permitted the use of Bessemer or open-hearth steel. No requirements as to strength or chemical composition were included, except that phosphorus was limited to a maximum of 0.10%. It was given one coat of red-lead paint at the shops. After erection, it was cleaned with stiff wire brushes and given a second coat of red-lead paint (30 to 33 lbs. of red-lead to 1 gallon of linseed oil). This was followed by three coats of white paint (white-lead and boiled linseed oil). The woodwork also is painted with the white-lead paint.

The foundations and walls are of concrete, the walls rising to a height of about 6 ft. above the floor, which is also of concrete. The concrete is composed of Portland cement, sand and stone in proportions of 1:3:5. The limit of size of stone is 2 ins. for the walls and foundations, and ¾-in. for the floors. Above the grade line the walls have an exterior rough-cast finish. Their interior finish is of rough concrete. They are covered with cast-iron sills, upon which rest the steel ribs. Beneath the Economic Building (at the rear) is a pump cellar 7½ ft. deep, from which a tunnel 4 ft. wide extends to the central building (the Aquatic House) to accommodate the steam and water mains and the electrical conduits. The floor of this tunnel is on a level with the floor of the Aquatic House, which is sunk 4 ft. below the level of the other buildings.

Along the ridge of each roof is a double row of ventilating sashes 3 ft. wide, operated from the floor by means of rods and bevel gears, as shown in Fig. 6. The vertical glazed sides of the buildings have hinged sashes, operated in the same way. The steam heating plant is on the vacuum system, with coils of 2-in. wrought-iron pipe giving sufficient radiation to maintain temperatures of 50° to 65° F. in the different buildings at night when the exterior temperature is — 20° F. The total area of the direct radiating

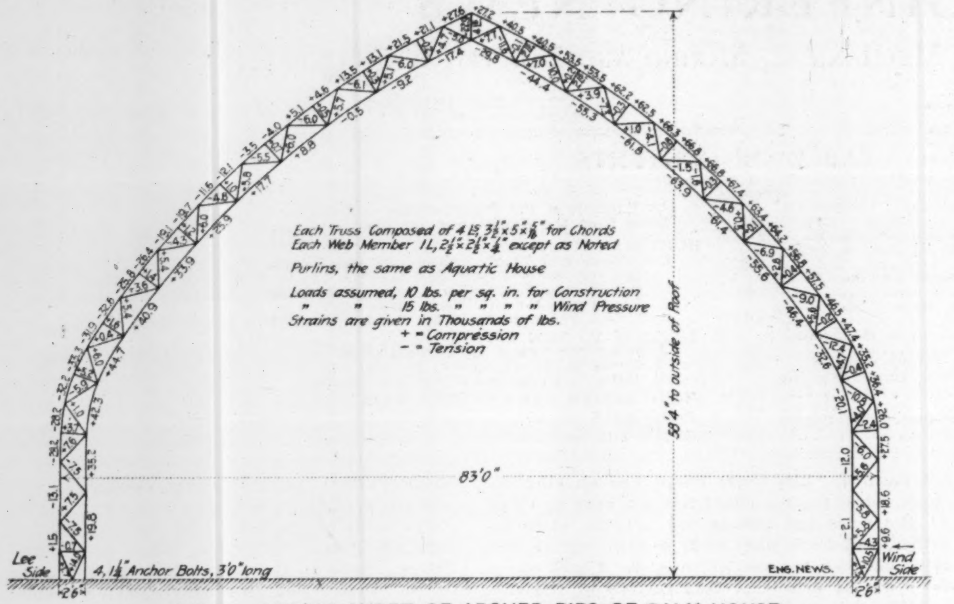


FIG. 2. STRESS SHEET OF ARCHED RIBS OF PALM HOUSE.

surface is about 25,000 sq. ft. A feed-water heater is provided for tempering the water used in sprinkling and watering the plants. Steam is obtained from the electric-light and power station of the park, the mains being carried 1,200 ft. in a concrete conduit or tunnel 3½ ft. wide and 4 ft. high. This conduit serves other buildings also, and eliminates the necessity for three separate heating plants. The buildings are fitted with electric light on the three-to-two wire system, with direct current of 240-120 volts. There are 700 lamps of 16 c. p.

The design of the building was prepared by Hitchings & Co., of New York, and the contract for their construction was awarded to Mr. C. E. Carson, of Chicago. The structural steel work was built by the Modern Steel Structural Co., of Waukesha, Wis. All the work was under the direction of the West Park Commission, of which Mr. J. Jensen is Superintendent, and Mr. A. C. Schrader is Chief Engineer. Mr. Arthur Wyld was Superintendent of Construction.

THE BY-PRODUCT COKE OVEN.*

By WILLIAM HUTTON BLAUVELT†, M. Am. Soc. M. E.

Coke is the product of the dry distillation of bituminous coal, or in other words, coke is the solid residue remaining after bituminous coal has been heated in a closed, or partially closed, chamber until all of the volatile matter has been driven off. This volatile matter consists mainly of tarry matter, gas and ammonia, familiarly known as by-products. Both the quality and quantity of the coke and the by-products vary considerably with the quality of the coal. In this country coals similar to those from the Pocahontas region, containing from 16 to 18% of volatile, stand at one end of the list, and produce the maximum yield of coke and the minimum yield of by-products. On the continent of Europe some coals are coked containing not more than 13% of volatile matter. At the other end of the list stand the highly gaseous coals which contain as much as 38 or 40% of volatile matter, and yield correspondingly small amounts of coke.

Good coke has a clearly defined cellular structure, with hard cell walls, the cells being small in size, and comprising about 55% of the total volume of the coke, so that its bulk for a given weight is about twice as great as that of broken anthracite coal. The well developed cellular structure and the hard cell-walls are important in the use of coke for metallurgical purposes, and account for its superiority in blast furnace work, for example, over anthracite coal, which was formerly the principal blast furnace fuel. The cellular structure presents a large surface to the oxidation of the air, producing rapid combustion, while the firm cell-wall prevents crushing and maintains an open fuel bed. The specific gravity of a good quality of standard coke is about 1.7 to 1.9.

Many investigators have attempted to discover the substance which makes coal coke, with a view to determining why some coals will coke and others will not. A French chemist, Mr. Lemoine, believes that he has isolated this substance and gives it the name of "carbene." It is a black solid friable material tending toward crystallization, having the formula $C_{22}H_{14}O_3$. Experience has demonstrated that coals which are high in oxygen are usually deficient in coking qualities, and either will not coke at all, or produce a coke having a weak, friable structure. As will be shown later, many coals which produce very indifferent coke under ordinary conditions, by proper treatment can be made to yield a good metallurgical coke.

The production of coke in this country has grown very rapidly during the last decade, as is indicated by the following figures. The column showing the production from by-product ovens indicates that the growth of this branch of the industry has been fairly rapid, although several conditions have united to check it during the last few years. In the figures below coke from gas works is not included.

A little study shows at once that the several types of coke ovens have sprung from three "root forms," the beehive oven, developed from the mound of the charcoal burners; the Coppée oven, with its vertical side

PRODUCTION OF COKE, NET TONS.

	Total.	From by-product-ovens.	Percentage of by-product coke.
1897	13,288,984	261,912	1.97
1898	16,047,209	294,445	1.87
1899	19,668,569	906,534	4.61
1900	20,533,348	1,075,727	5.24
1901	21,795,883	1,179,900	5.41
1902	25,401,730	1,403,588	5.53
1903	25,274,281	1,882,394	7.45
1904	23,661,106	2,608,229	11.02
1905	32,231,129	3,462,348	10.74
1906	36,401,217	4,558,127	12.52

heating flues, and long narrow coking chamber; and the Knab-Carvés, with the same narrow coking chamber and with horizontal side flues.

In the beehive oven the coal is coked in a flat layer, say 12 ft. in diameter, and about 24 to 26 ins. thick. In the retort oven the coal lies in a long narrow chamber from 30 to 40 ft. long, from 6 ft. to 8 ft. high, and from 16 ins. to 22 ins. wide. The essential distinction between the beehive and retort oven processes is that in the former the combustion which produces the heat for coking the coal, takes place within the coking chamber, above the coal. Air is admitted at the front door, and the products of combustion escape through a hole in the roof. In the retort oven the heat is generated by the combustion of gas in flues in the side walls; the heat passes through the walls into the coking chamber, but the products of combustion and the air are carefully excluded from the coking chamber. In the latter process, therefore, there is a true distillation of the coal, while in the former (the beehive oven) the admission of air materially changes the composition of the tars so that they are richer in the oils and paraffines, more like the tar produced from the Scottish blast furnaces, for example, where raw coal is used in place of coke. The admission of the air reduces the value of the tar products, as well as the quantity, and also destroys practically all the ammonia. The tar from the closed, or retort oven, on the other hand, contains considerable quantities of benzine, naphthalene and anthracene, and other of the aromatic hydrocarbons which have given coal tar its great value in the manufacture of so many organic compounds, dyes, drugs, etc.

The retort oven may be arranged to recover the by-products from the distillation of the coal, or not, depending upon the market conditions and the quality of the coal coked. The coking process is essentially the same in both cases, except that when the by-products are not recovered the gas from the coal is led directly to the oven flues, while, when they are to be saved, the gas coming from the ovens is cooled and scrubbed to free it from the tar and ammonia, and is then returned to the oven flues. In both cases regulation is, of course, necessary, so that a suitable amount of gas is admitted to the flues to properly carry on the coking process.

The author has given, in some detail, in "Mineral Industries," vol. 4, p. 215, the various steps of the de-

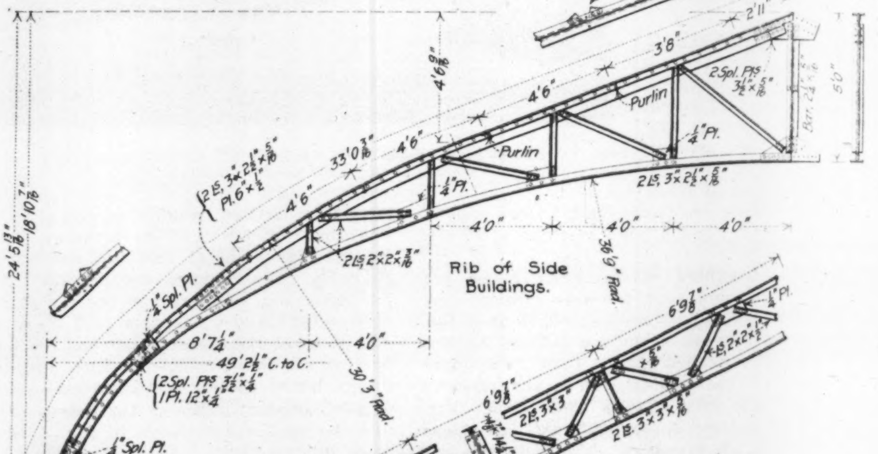


FIG. 3. STEEL RIBS OF THE SIDE BUILDINGS AND THE CENTRAL BUILDING.

*A paper presented before the Gas Power section of The American Society of Mechanical Engineers at the Detroit Meeting.

†Consulting Engineer, Semet-Solvay Co., Syracuse, N. Y.

FIG. 4. INTERIOR OF SIDE BUILDING, GARFIELD PARK CONSERVATORY; (SPAN 50 FT.).

velopment from the earliest types of the beehive oven and of the various forms of by-product ovens in use in Europe. As our interest is rather in the by-product oven as it exists today in this country, this discussion will be confined to the types which have representatives here.

The beehive oven is, in general, familiar. As now built it is about 12 ft. in diameter inside, and about 6 ft. 9 ins. high to the top of the domed roof. The ovens are built in either single or double rows, banked together with masonry to prevent loss of heat. A charge of about six tons of coal is delivered by a larry through a hole in the roof. Each charge of coal is fired from the heat remaining in the walls from the preceding charge; the air for combustion enters at the front door, the products of combustion escaping through the charging hole in the roof, producing the "pillar of cloud by day and pillar of fire by night" familiar to travelers in our coke regions. When the operation is complete, the coke is quenched with water by means of a pipe introduced through the front door, and after cooling, the coke is drawn either by hand or by machine, onto the wharf in front of the ovens, whence it is loaded into cars. The labor of drawing the ovens is the most expensive and laborious item connected with the operation. Much study has been given to devices for drawing the coke, and recently one has been developed which promises permanent success. It is arranged to travel on a track in front of the ovens, and when the oven is open and the arm thrust in, the coke is pulled onto the conveyor which automatically delivers almost the entire contents of the oven directly into the railroad car.

The coking process occupies from 48 to 72 hours, so that the output of a beehive oven is from 1.5 to 2 tons of coke per day. The U. S. Geological Survey report for 1905 gives 394.8 tons as the average output per active oven in that year. The beehive oven has been carried to its highest perfection in this country, and the above mentioned drawing and loading apparatus is only one of the comparatively recent improvements.

The use of silica brick in the construction of the beehive oven has become quite general, and is a distinct step in advance, notwithstanding that the general experience with silica brick, in regard to its rapid destruction when suddenly cooled, caused nearly all coke manufacturers to be very skeptical regarding its use until it had actually been tried.

In the present condition of our iron industry, subject as it is to extreme fluctuations, the beehive oven has certain advantages; it is quickly built and at relatively low cost, and the labor required for operation is of low grade. It may be put out of run at relatively small loss during the periods of industrial depression, and it can be started up again with ease after a shutdown. But with changed conditions the iron industry is becoming more stable; and moreover, the coals which were especially adapted for use in the beehive oven, are becoming more and more scarce, especially with the approaching exhaustion of the Connellsville field. There are very large deposits of coal in this country which are not well suited to the beehive oven, but which, under proper treatment will make excellent coke in the retort oven. In many sections of the country these deposits are the natural sources of supply for important metallurgical plants. In this respect the case is similar to some of the important iron districts of continental Europe, where the available coals may be coked only in the narrow retort oven, and where the beehive oven has long since entirely disappeared. It is especially in such cases that our attention is turned to the retort or by-product oven. This is essentially a long narrow firebrick chamber, from 30 to 40 ft. long, from 7 to 9 ft. high, and from 16 to 20 ins. wide. It is closed at each end by doors lined with firebrick and usually there are from three to six holes in the roof through which the coal is charged. In the side walls and under the bottom of the chamber there are heating flues in which is burned a portion of the gas produced by the distillation of the coal, the heat passing through the firebrick walls into the coal. These heating flues are arranged sometimes vertically and sometimes horizontally. These ovens are built in blocks of from 25 to 50 or more. The distillation of the coal in this tightly closed chamber by heat from without, forms the essential characteristic of the retort oven.

The products of the distillation of the coal pass from the oven chamber through a hole in the roof to a large pipe, or main, extending along above the block. In some designs this main contains some water and the gas is forced through it in a manner similar to the hydraulic main of the gas works. The distillate, as it comes from the ovens, consists of a gas similar in general composition to ordinary illuminating gas, and it is loaded down with water and tar vapors and also carries ammonia. If the tar and ammonia are to be recovered from this gas, it is led to the by-product recovery building for treatment. If not, a proper proportion of the gas is returned to the oven flues and burned there with a properly regulated supply of air. The remainder, if any, is available for raising steam. The air is usually preheated either by regenerators, similar in principle to those of the Siemens furnace, or by transmission of the heat through thin walls of firebrick, commonly called recuperation. The heat for preheating the air is taken from the hot gases leaving the oven flues. In many plants these hot gases, after giving up a portion of their heat to the air, are passed under boilers for raising steam for operating the plant.

In the plants which recover the by-products, the gas coming from the main is treated in apparatus similar in general to that used in the manufacture of illuminating gas. The temperature is reduced gradually, so as to avoid shock of the gas with a consequent precipitation of naphthalene and the lighter hydrocarbons which form the principal illuminants of the gas, and is finally brought down to about the temperature of the atmosphere. This work is done in large vessels cooled either by air or by water. There are a number of types of these coolers or condensers, a common form being a series of vertical cylinders containing tubes like a vertical boiler. Through these tubes water is circulated which cools the gas progressively as it passes from one vessel to another. During this cooling process most of the tarry matter and water vapor are thrown down, the latter carrying with it considerable quantities of ammonia.

After these condensers come the tar extractor and then the scrubbers, whose function is to remove the remainder of the ammonia and tarry vapor, and sometimes also the benzol and cyanides. The gas is drawn from the ovens and forced through these various apparatus by means of a rotary exhauster, operated either by a steam engine or electric motor. The ammonia is removed in a scrubber which may be of the "bubbling" or of the "rotary" type.

The "bubbling" type consists essentially of a vertical cylinder containing a series of compartments having inverted cups or bells with serrated edges dipping into water, so arranged that the gas bubbles through the water in fine streams, passing upward through the several compartments. Water is fed in at the top and

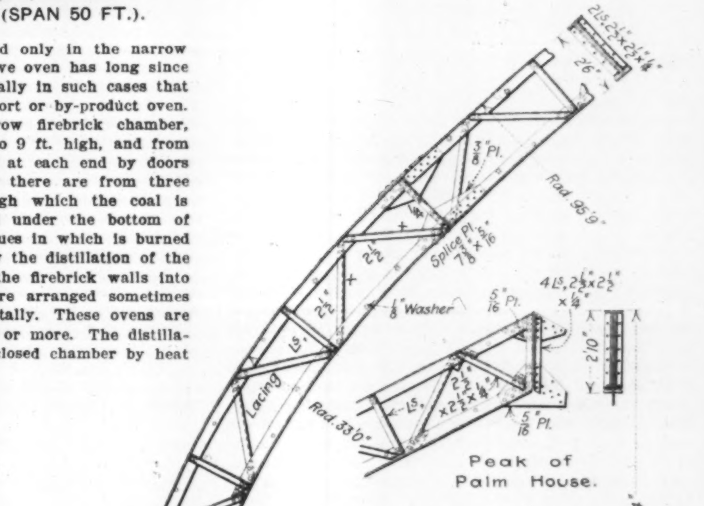


FIG. 5. STEEL RIBS OF THE PALM HOUSE AND THE CORNER BUILDINGS.

runs out at the bottom as ammonia liquor containing from ½ to 2% of ammonia. The rotary scrubbers are essentially large horizontal cylinders with a shaft running through them horizontally. On this shaft are arranged metal sheets, or brushes, or wooden slats so disposed as to offer the maximum amount of surface to the gas as it passes through the several compartments into which the cylinder is divided. The slow revolution of the shaft keeps the surfaces wet, the lower part dipping into water which partially fills the vessel. Water is fed in at one end and the liquor runs out at the other in the same manner as in the other apparatus.

The benzol and cyanide scrubbers are similar in construction, but instead of water, heavy oil of tar or petroleum is used to absorb the benzol, and for the cyanides, ferrous sulphate in an alkaline solution. After this treatment the gas is ready to be returned to the ovens for heating the flues, or to be sent out for use in gas engines, for illuminating gas, or for fuel, as market conditions determine. If it is to be used for illuminating purposes, it must be purified by its sulphur compounds in a similar manner to illuminating gas. When destined for this use it is also desirable to retain all of the illuminants. The removal of benzol is therefore omitted, and frequently advantage is taken of the fact that in the distillation of coal the early portion of the distillation produces gas much higher in illuminants than the later portion. The gas piping from the ovens is therefore arranged, under these circumstances, so that the first portion of the gas coming off from each oven, say during the first six or eight hours of the coking process shall be kept separate from the remaining portion, lower in illuminants. In some plants the benzol is recovered from the portion carrying the lower illuminants, which is to be used for heating the ovens, and when this benzol is added to the richer portion, a gas is produced of much higher candle power than could be obtained from the same coal in the ordinary gas works, for example.

The tar and the ammonia liquor recovered from the various operations just described are collected in large tanks, and separated by the difference in their specific gravities. The tar is pumped to tanks for shipment, and the ammonia is sent to the ammonia distilling plant. This ammonia liquor, commonly called "weak liquor" contains as above, from one-half to 2% of ammonia, also some of the lightest tar oils. The ammonia exists partly in the form of sulphate, chloride and other fixed salts, from which the ammonia can be freed only by the admixture of lime, or some similar alkali, and the remainder as "free ammonia" in combination with carbonic acid, hydrogen sulphid, etc. When all of the fixed ammonia has been freed from the acid by the addition of lime, it is driven off from the liquor by boiling with steam, the condensed gases carrying a certain portion of water, to form the crude ammonia liquor of commerce. By the introduction of additional apparatus and the modification of the process of distillation, so as to separate the ammonia gas from the accompanying impurities, the aqua ammonia of commerce may be produced. Or the ammonia gas coming from the distillation apparatus may be absorbed in sulphuric acid, producing sulphate of ammonia which is described more at length elsewhere.

The recovery of benzol from the heavy oil used as an absorbent is effected by heating with steam in apparatus similar, in a general way, to that used for the ammonia. The benzol oils are driven off and condensed as crude benzol ready for purification, and the heavy oil is returned to the scrubber to be used again.

The modern by-product oven plant includes, among its more important mechanical problems, the delivery of the coal to the ovens and the removal of coke. The earlier installations in this country were small and the quantities of coal and coke handled did not justify the installation of much special apparatus, but with larger installations, consuming from 1,500 to 3,000 tons of coal per day, and producing an equivalent quantity of coke, the handling apparatus has become one of the important features of nearly every plant. The location of these plants at the blast furnace, and the absolute dependence of the furnace on the coke produced, has made it necessary to store coal to prevent interruption of the operation from strikes, car shortages, etc. Also the location of some plants demands the storage, during the winter months, of coal which is brought by vessel in the summer. Then it is necessary to install unloading machinery. For example, an oven plant designed under the writer's direction a short time ago, is arranged with a capacity for unloading over 400 tons of coal per hour from vessels, and with apparatus for receiving this coal from the vessel and storing it at the same rate up to an amount of 300,000 tons. This apparatus will, at the same time, reclaim coal from this storage pile at the rate of 200 tons per hour and deliver it to the coal bins.

At this plant, among others, the engineering problem was further complicated by the necessity of mixing two coals of different composition in order to produce a coke of suitable quality. So the apparatus had to be arranged to store these coals separately, reclaim them separately, and bring them together in a mixture of proportions determined by the quality of the coals, and deliver this mixture to the oven bins. It was also necessary to grind the coal in order to insure the best physical structure of the coke. The standard at this plant is that over 70% must pass through a [illegible]-in. mesh screen, and this work must be done at the rate of at least 200 tons per hour. Such undertakings present some very interesting problems in mechanical engineering, and upon their solution depends to a great extent the economical operation of the whole plant.

The operation of charging the ovens is a very simple one. The coal, prepared as described above, is delivered in bins above the ovens and drawn into a larry or car which runs over the top of the oven blocks, operated by a motor. This car is arranged with suitable chutes, and on opening the charging holes on the tops of the ovens the coal is allowed to run in and fill the oven chamber. These charging holes are then immediately closed, and the top of the coal is leveled off by means of a reciprocating ram, operating through one of the doors at the end of the oven. This leveling produces sufficient space for the gases to escape and reach the exit pipe, and also to provide for the swelling of the charge which usually takes place during the coking.

When the gases have been driven off from the coal, which requires a period of from 18 to 30 hours, depending upon the coal and the oven, the doors at each end of the oven are opened, and the mass of coke is pushed out by a ram, operated by steam or electricity. This ram travels up and down in front of the ovens as

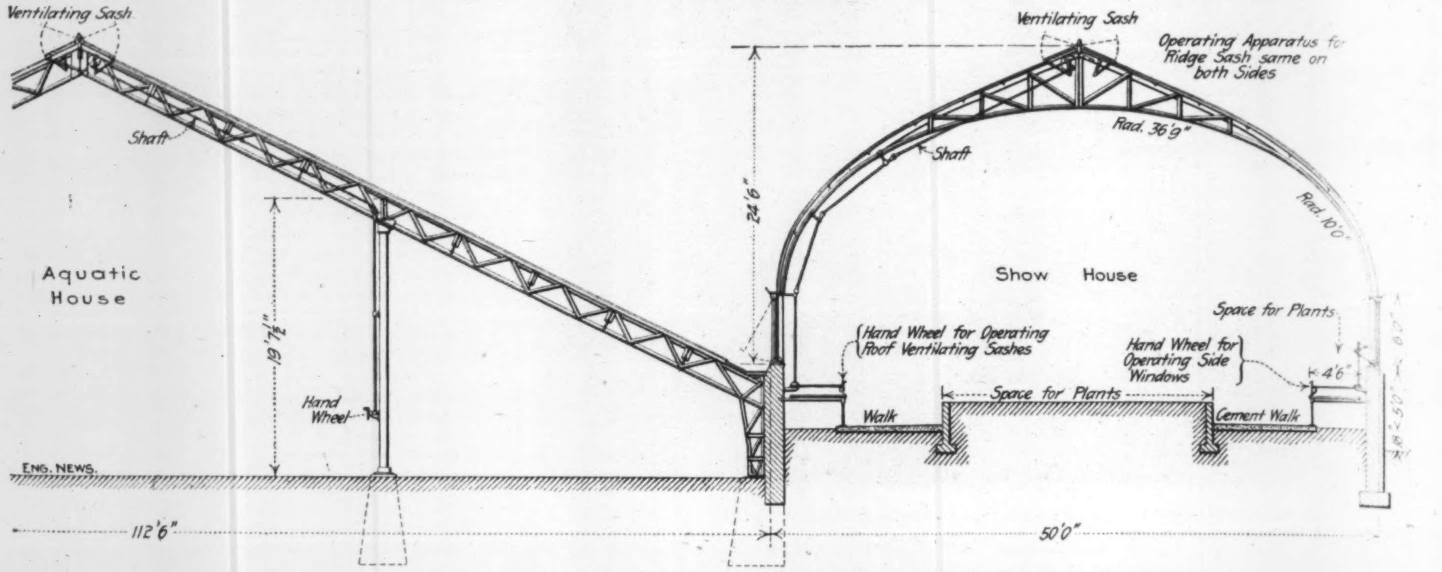


FIG. 6. HALF CROSS SECTION THROUGH SIDE AND CENTRAL BUILDINGS; GARFIELD PARK CONSERVATORY, CHICAGO.

FIG. 7. INTERIOR OF CENTRAL BUILDING, GARFIELD PARK CONSERVATORY. (SPAN 112½ FT.).

required, and usually carries the leveling device above mentioned. By this method the coke is discharged in a few minutes, and the oven is ready for another charge, which is dropped in as soon as the doors are closed.

The coke, on discharging, must be quenched. The old way, and the one largely employed in Europe still, is to spread the hot coke on a brick pavement and water it with a hose. This does not usually give the best results, however, as the coke is blackened and frequently is made too wet. A number of devices have been developed for quenching, with varied success. In one, the coke is run into a tight firebrick chamber and water is admitted, the pressure of the steam generated driving the water throughout the different parts of the mass. In another plan, the coke is pushed out into a car 30 ft. long and 10 ft. wide, having an inclined bottom so arranged that by drawing the car along as the coke is pushed out it is distributed in a uniform layer, and is then quenched by a heavy stream of water, which is applied as soon as the coke reaches the car. Another device is in the form of a box-shaped frame, built up of water pipes so arranged that the coke is pushed out through it and quenched by a shower of water forced through perforations in the pipes—a sort of needle bath.

After quenching, the coke is delivered either into railroad cars or is carried directly from the original quenching car to the blast furnace bins, or to a sorting and picking plant, in case the product is to be sold for foundry coke. In this picking plant the coke is delivered from a small hopper onto the picking belt, where the black ends are removed, as is the custom in preparing foundry coke, and the small pieces are screened out, the coke being delivered to the car without any handling except of the rejected pieces.

All of this work was formerly done by hand, and the difficult quality of the material and the severe requirements of the market required the development of some special apparatus in order to accomplish the results mechanically, with low repairs and good efficiency.

With this general use of machinery, of course, the power plant becomes an important part of the installation since, in some installations, at least, all the apparatus and machinery are electrically driven.

Consumption of power in a plant of by-product coke ovens, of course, depends very much on the arrangement of the plant, and especially upon the conditions under which the coal and coke have to be handled. The following is the distribution of power consumed at one plant coking about 1,500 tons of coal per day. The figures represent the average daily consumption in kilowatt hours. Of course, many of the operations, such as pushing and charging the ovens, are very intermittent.

	KW.-hr.
Handling coal to and from storage pile	450
Coal conveyors	900
Crushing and pulverizing coal	1,130
Gas exhausters	1,280
Rotary scrubbers and pumps in by-product recovery plant	1,250
Pumps handling ammonia liquor	255
Pushers	684
Coal charging	168
Coke handling	1,440
Pumping water	45
Lighting	730
	8,332

Some special problems in design arise on account of the large requirements of steam for the distillation of the ammonia and other by-products. On this account a simple type of engine, operating under (say) 10 to 15 lbs. back pressure, presents strong arguments for favor in comparison with more efficient engines. The use of the exhaust steam for distillation makes available the latent heat in the steam, as well as the sensible heat down to the temperatures at which the waste liquors are discharged. So that while by this method only 20% of the heat in the steam is consumed in the engine, the remaining 80% becomes available for the work of distillation. The steam consumption in such an engine is about 45 lbs. per horsepower. But when the exhaust steam is needed for distillation it is hard to equal the economies of this combination as compared with other types of steam engines, or even gas engines, combined with the use of live steam for distillation.

In addition to the problems of handling materials and the development of the mechanical appliances about the plant, which have been special features of the growth of the by-product oven in America, much progress has also been made in the oven itself. Although this retains its original form, the size and coking capacity have been much increased. The earliest retort ovens in this country had a cubical capacity of 220 cu. ft., and had an average coking capacity of 4.4 tons of coal per 24 hours. Some of the ovens of today have a capacity of 430 cu. ft., or more, and coke about twelve tons of coal per day. Experimental installations are operating satisfactorily having an output materially above this figure.

Among the mechanical devices connected with the retort oven is the stamping machine. This machine has been used largely in Europe, but only to a small extent in America. It is used for the purpose of compressing the coal into a cake before charging into the oven. Many coals, on account of their composition, do not produce a coke of satisfactory physical structure by the ordinary methods of treatment, but when they are compressed into a cake, the physical structure of the coke is very much improved.

The process is in principle a simple one. A box or form is provided, slightly smaller than the oven chamber. This box is filled with coal, and during the process of filling the coal is compressed by heavy stamps traveling back and forth the length of the box, so that there is a reduction of volume of from 20 to 25%, as compared wtih the loosely charged coal. The coal is dampened before stamping, and it is not difficult to form a cake having sufficient strength to permit of being pushed into the oven. Besides the improved quality of the coke, the output of the ovens is at many plants increased by about 10%, and in some cases the managers state that they prefer this method of charging coal into the oven, even aside from its effect on the quality of the coke. The illustration shows a pusher combined with the stamping machine, so that the whole apparatus travels up and down together in front of the ovens, the coal being stamped in transit.

Five different types of by-product recovery ovens have been built, or are building in this country. One of these, the Newton Chambers, is an English adaptation of by-product recovery to the beehive oven, but the plant which is the only American representative of this type of oven has been out of run for some time. This system consisted essentially of a series of vertical cast-iron U-pipes, arranged to receive the gases from the beehive oven and condense out the tar and ammonia vapors, by cooling with air or water, the scrubbed gas being returned to the oven, which was heated partly by the flues underneath, and partly by combustion in the upper part of the chamber containing the coal. As pointed out before, this method cannot but give low yields of ammonia and tar of inferior quality.

The four types of by-product ovens in operation and under construction in the United States are all of the retort oven type, and have all been developed from the original types of the Coppée or Knab-Carvés designs. Of these there are eleven plants of the Otto-Hoffman and the United Otto type, 13 plants of the Semet-Solvay type, three plants of Rothberg ovens, and one plant of Koppers ovens, making a total of 28 plants or 4,763 ovens. Detailed descriptions of these ovens having appeared elsewhere, I shall confine myself to a statement of the distinguishing points of the several systems.

A typical United Otto oven plant is supported on steel girders resting on concrete piers and is of the vertical flue or Coppée type; that is, the gas is burned in a series of vertical flues arranged in the side walls between the oven chambers. The gas for heating the flues, which has been scrubbed and cooled in the by-product plant nearby, is delivered into the main combustion flue, both at the end of the oven and below in the gas pipes shown. The products of combustion pass into one of the regenerative chambers shown, thence to the stack, and the air is preheated in these chambers, on the principle of the familiar Siemens regenerative furnace. The currents of gases and hot air are reversed at suitable intervals. During each of these periods the gases pass upward through one-half of the oven flue system, and downward through the other half, their path being reversed at each reversal of the regenerator valves.

The Semet-Solvay oven is a development of the Carvés type. Its salient feature is the horizontal flue system with strong middle walls which support the roof structure and the additional loads of charging larry, etc. The horizontal flue system is heated by means of gas introduced into the ends of all but the lowest flue. At each admission it meets with air for combustion which has been preheated by the escaping gases through the thin walls of the "recuperator" arranged below the oven. The horizontal flues with the multiple gas admission admit of very accurate control of the heat and of its even distribution throughout the coking chamber. The main object of the central division wall above mentioned is the prolonged life of the oven structure, which results from taking the weight off of the thin and highly heated flues, and it also permits repairs to be made to any oven without shutting down any of the adjacent ovens.

The Rothberg oven is of the horizontal flue type, but more like the Huesner oven which has been developed in Germany, in that it has only one flue system between each coking chamber. This flue system is divided in the center by a vertical wall, forming two compartments with short horizontal travel for the gas. Every alternate flue is served by a gas burner, and all flues can be inspected by walking along the platforms at the ends of the oven. A series of dampers in the flues is arranged, which cause the gas to travel either the whole length of the flue system, or to pass directly to the next lower flue, in case the heating conditions of the oven demand it. These ovens may be built either with or without recuperators or regenerators.

The Koppers oven is of German development, and the first plant is now under construction in this country. It is a vertical flue oven of the Coppée type. Its essential features, as described in the American patents, are the special arrangements for the control of gas and air and their combustion in the oven flues. These consist essentially of the arrangement of the ports, so that the gas and air travel spirally through the flues, thereby carrying the heat higher up in the oven and preventing local combustion at the point of entrance. Also the control of the effective area of each flue, so as to distribute the heat uniformly over the side of the oven chamber, and provision for examining all the flues through openings arranged for that purpose. The air, and sometimes the gas, are preheated in regenerators arranged underneath, one pair of regenerators for each oven.

In the by-product apparatus used in the various oven plants and in the general arrangement for handling the coal, coke and other products, there are many variations, but these are rather to meet the conditions of the individual locations than inherent to any special oven system.

In addition to the various problems in mechanical and chemical engineering presented by the operation of the by-product coke oven, there are a number of metallurgical problems, some of which have been solved with material gain in the efficiency of the coking operation and the yield of by-products; the solution for others is yet to be found. The driving off of the hydrocarbons from coal by distillation is a very complex process. Each change in conditions of the temperature, rate of distillation, etc., gives different results, and on account of the hydrocarbons being so complex in composition, no definite figures can be placed on the operation. Many experiments, for example, have been made to determine the amount of heat absorbed in the coking process per unit of coal coked. Many processes have been devised for converting the major portion of the nitrogen in the coal into ammonia. These and other problems, however, are not much nearer solution than when the by-product process was first introduced into this country. The experience in the retort house of the gas works has shown that high heats and rapid coking increase the volume of the gas and tend to break down the heavier hydrocarbons, and the same is doubtless true in a measure in the retort oven, although the much greater bulk of the charge, the different relation between the volume of the gas produced in proportion to the heated surface of the retort, etc., modify these conditions.

The coking time of a charge in the oven depends upon the temperature of the heating flues, and the rate of transmission of the heat through the wall. Until recently "quartzite" brick have been used for these flue walls, in accordance with the European practice. Quartzite is the ordinary firebrick with sufficient quartz rock added to make the brick about neutral in its expansion and contraction, and contains about 60% silica. Recently, however, silica brick has been introduced somewhat generally, notwithstanding the additional complication of its considerable expansion under the temperatures of oven chamber. Silica has the advantage of not being injured by the higher heats required by latest practice, and it is also a materially better conductor of heat than the quartzite. Magnesite is very attractive on account of its very high conductivity, but this material has not yet been successfully used.

The conductivity of firebrick increases with the temperature. There is no data available giving the exact relation of conductivity of either clay or silica brick at coking temperatures, but experience shows that a moderate increase in the thickness of the flue wall does not necessitate a materially higher temperature in the flue in order to maintain a given temperature in the coking chamber.

It has not been observed that the yield of coke from any given coal is affected by the speed of coking. When the coking operation is properly conducted, with entire exclusion of air, there is always deposition of hydrocarbons, and an increased yield of coke above the theoretical. This increase in yield is probably due to the pressures existing in the oven chamber, and the prolonged period of contact of the gases with the coal in process of coking. The retort oven always yields higher percentages of coke than can be obtained either in the crucible or in the gas retort, probably for the above reasons. The yields of by-products are not affected by temperature to anything like the same extent in the retort oven as in the gas retort where it is recognized that the higher temperatures produce larger volumes of gas higher in hydrogen and lower in hydrocarbons, together with lower yields of tar. As suggested above, these phenomena are doubtless due to the different relations between volume of retort and volume of charge.

The presence of water in the coal when charged increases the coking time, since, of course, the water must be driven off before the coking process begins, and therefore the penetration of the heat into the charge is delayed by that amount. The addition of water up to 10 or 12% does not add seriously to the coking period, but the amount of heat absorbed is considerably increased, and there is also additional work thrown upon the condensing apparatus, in cooling the products of distillation.

The rate of distillation of the coal in the oven (known

in practice as the coking time) varies with the quality of the coal and especially with the content of volatile matter; but this rate does not vary directly with the percentage of volatile matter, probably because in the coals containing the most volatile matter distillation proceeds at a much more rapid rate during the early part of the process. This is illustrated by the accompanying table, showing the amount and composition of the gas produced from a low volatile and a high volatile coal during each hour of the coking process.

The coke from the by-product or retort oven differs in some respects from that made in the beehive. On account of its being quenched outside of the oven it has lost the silvery glaze seen on the beehive coke. Formerly this was thought to be of some importance, as the glaze was supposed to help resist the action of carbonic acid on the coke in the blast furnace. Repeated experiments, however, have shown that the retort coke is rather more resistant to carbonic acid than beehive coke made from the same coal. Owing to the difference in method of applying the heat, the shape of the pieces of coke is different. In the beehive oven the heat generated by the combustion of the gases above the coal works downward, developing a long finger-like structure. In the retort oven the heat is applied from both sides and works toward the middle, resulting in short blocky pieces somewhat less in length than half the width of the oven. Retort oven coke is somewhat denser than beehive coke from the same coal, the percentage of cells being slightly smaller.

There is still some difference of opinion among furnacemen as to the relative value of the two cokes in the blast furnace, owing to differences in individual experiences. Retort oven coke has received a great deal of criticism in this country because much coke has been made from coal which would be quite out of the question for use in the beehive oven. The reasons for using such coals were doubtless satisfactory to the management of the oven plants, but the coke produced has been often held up for comparison with Connellsville beehive coke, which is perhaps the very best beehive product in the world. There are so many different grades of retort and beehive coke produced from the different coals, and under different conditions in the several plants in operation, and on this account a definite comparison of the two general types of coke is practically an impossibility. Some of the best furnace work in the country has been done with retort coke, which would seem to justify the statement that the best retort coke is as good as the best beehive coke in the blast furnace.

In the foundry cupola retort oven coke has an exceptional record, and in some localities it is without question the standard of foundry coke.

In the beehive operation some of the fixed carbon is burned, while in the retort oven no combustion of the carbon can take place, and the yield is, therefore, up to or above the theoretical. On this account the retort coke is always somewhat purer chemically than beehive coke from the same coal. This gives the former a somewhat higher percentage of carbon, and lower percentage of ash, phosphorus, etc.

The by-products produced at plants operated in this country are tar, ammonia, gas and benzol. Cyanides are not being recovered at any of the American plants.

The tar is the standard coal tar of commerce, and does not differ materially from that produced by gas works. In Europe the great briquetting industry is built up on the basis of tar from by-product ovens, since coal tar pitch is the only binder for briquettes which has been largely successful. Pitch constitutes from 60 to 70% of the tar, the remainder being heavy oil, consisting of creosote oil, naphthalene, anthracene, etc., and the light oils which are mainly impure benzols. These are separated by distillation, the pitch remaining as residue. As is well known, coal tar is the basis of a large number of important industries, especially in continental Europe, but only a portion of the tar is available for these higher grade products. Anthracene is the raw material for alizarin, and naphthalene is the basis of artificial indigo. Carbolic acid is formed from the creosote oils, and from the benzols are derived most of the long list of aniline colors, the manufacture of which has become such an important German industry.

ANALYSES AND YIELD OF GAS FROM HIGH VOLATILE COAL.

Hour	Cu. ft. per hr.	CO_2	C_6H_6	C_2H_4	Total Ill.	O	CO	CH_4	H	N	B. T. U. per cu. ft.
1	829	0.9	0.9	3.2	4.1	0.5	5.8	41.5	41.4	5.8	693.4
2	562	0.9	1.0	2.6	3.6	0.4*	5.1	40.4	43.8	5.8	681.5
3	582	0.9	1.0	2.1	3.1	0.7	4.9	37.6	47.2	5.6	654.2
4	582	1.1	1.1	2.1	3.2	0.4	5.0	36.2	48.6	5.5	648.5
5	582	0.8	1.0	1.7	2.7	1.0	4.6	33.3	49.5	8.1	588.6
6	452	1.1	0.9	1.6	2.5	1.1	4.6	31.4	49.8	9.5	583.8
7	490	2.2	0.9	1.3	2.2	1.6	4.4	31.0	47.6	11.0	566.2
8	449	0.9	1.0	1.5	2.5	0.5	4.8	31.5	54.2	5.6	603.0
9	432	..	..	..	..	..	..	..	..	..	..
10	456	1.0	0.5	2.0	2.5	0.6	4.9	29.1	55.3	6.6	..
11	474	..	..	..	..	..	..	..	..	..	..
12	470	0.6	0.1	0.3	0.4	0.4	5.3	23.1	64.8	5.4	..
13	494	..	..	..	..	..	..	..	..	..	..
14	405	0.5	0.0	0.4	0.4	0.6	5.3	18.2	67.0	8.0	..
15	460	..	..	..	..	..	..	..	..	..	..
16	460	0.2	..	0.0	0.0	0.4	6.2	13.6	69.4	10.2	..
17	386	..	..	..	..	..	..	..	..	..	..
18	388	..	..	..	..	..	..	..	..	..	..
19	148	..	..	..	..	..	..	..	..	..	..
20	34	..	..	..	..	..	..	..	..	..	..
21	48	..	..	..	..	..	..	..	..	..	..
22	13	..	..	..	..	..	..	..	..	..	..
Total cubic feet										9,194	

The practical absence of these chemical industries in this country has been one of the causes of the relatively slow growth of the by-product oven here. While it may be some time before the manufacture of these refined products obtains an important foothold here, yet the briquetting industry, after many years of experimenting and failure, is at last becoming established commercially. Some half dozen plants located in different parts of the country have their product on the market on a commercial basis, and their growth should be rapid.

The low prices and high quality of coals that have been generally available, together with our high labor cost, have delayed the establishment of this industry here, but the increasing price of anthracite has encouraged the development of briquettes from the smaller and unmarketable sizes of anthracite from the coal yards and washeries in the East. In the Middle West the mining of some of the non-coking coals is accompanied with the production of a large amount of fine coal not available for general use. This and other relatively low-priced coals form a considerable supply for briquetting. Farther west the lignites and semi-lignites offer a very promising field. Many of these coals break down badly upon exposure to the atmosphere into a fine powder which is practically useless. Briquetting prevents this disintegration, and a properly made briquette will stand a year's exposure to the elements without apparent injury, while the coal from which it is made would be reduced to a powder within a week or two. The engineers of the Fuel Testing Plant of the United States Geological Survey at St. Louis have made an interesting series of tests covering the briquetting of a large variety of coals, and their results are most encouraging, especially on the classes of fuels last mentioned.

The process of briquetting is essentially a simple one, although the conditions necessary for success with each fuel must be definitely determined and maintained. The plants are not expensive or complicated, and now that works are operating commercially under widely different conditions and environments, a satisfactory growth of the industry should no longer be delayed.

The increased price of lumber and the destruction of our forests is bringing the preservation of lumber by creosoting prominently to the front, especially among the railroad companies for their ties, and the demand for creosoting oil is already increasing. New uses are being found for the benzol oils, as will be shown below.

Moreover, the application of tar to road surfaces is rapidly growing in favor. Especially since the introduction of the automobile it is found that no material produces a better road surface for the money expended than tar. This is sprinkled on the surface of the road and rubbed in with brushes, and if a penetration of an inch or so is effected, the surface of the road is impervious to water, and the presence of the tar produces an elastic condition of the surface which has a rather remarkable effect in increasing the wearing qualities of even indifferent road-making material. Tar can be quickly applied either to a new or an old surface, preferably the former. Dust is eliminated almost entirely, and by resprinkling every year or two, depending upon conditions of travel, material, etc., the road surface is kept in perfect condition, except, of course, for the replacement of material actually worn away.

ANALYSES AND YIELD OF GAS FROM LOW VOLATILE COAL.

Hour	Cu. ft. per hr.	CO_2	C_6H_6	C_2H_4	Total Ill.	O	CO	CH_4	H	N	B. T. U. per cu. ft.
1	536	0.1	0.5	6.0	6.5	0.8	4.6	31.6	42.1	14.3	643
2	425	0.1	0.7	3.6	4.3	0.8	4.3	32.8	51.6	6.1	638
3	475	0.1	1.1	3.8	4.9	0.7	4.9	33.2	46.8	9.4	641
4	357	0.1	0.9	3.3	4.2	1.1	4.6	33.5	49.6	6.9	637
5	411	0.1	0.8	3.7	4.5	0.8	4.6	33.1	50.8	6.1	644
6	401	No sample taken			..	..	..	..	..	..	..
7	517	0.2	0.7	2.5	3.2	1.0	4.4	30.1	44.4	16.7	560
8	387	0.2	0.5	2.9	3.4	0.9	4.5	32.6	46.2	12.2	598
9	400	..	..	..	..	..	..	..	..	..	..
10	320	0.0	0.4	1.6	2.0	0.9	4.1	29.1	47.4	16.5	..
11	256	..	..	..	..	..	..	..	..	..	..
12	189	0.1	0.5	1.2	1.7	0.6	4.6	29.5	53.6	13.9	..
13	251	..	..	..	..	..	..	..	..	..	..
14	256	0.1	0.2	0.6	0.8	0.9	4.4	17.0	69.2	17.6	..
15	387	0.0	0.3	3.5	3.8	4.9	2.9	3.0	44.0	41.4	..
16	425	..	..	..	..	..	..	..	..	..	..
17	260	..	..	..	..	..	..	..	..	..	..
18	37	..	..	..	..	..	..	..	..	..	..
19	17	..	..	..	..	..	..	..	..	..	..
20	0	..	..	..	..	..	..	..	..	..	..
UNPURIFIED.											
4	..	1.9	1.1	4.0	5.1	0.8	4.6	33.0	46.7	7.9	..
6	..	2.0	1.2	3.3	4.5	0.9	4.4	30.0	44.7	10.0	..
8	..	2.2	0.8	2.8	3.6	0.8	4.2	31.2	46.2	11.8	..
Total cubic feet										6,307	

By-product ovens have for some years been the leading producers of ammonia in this country. The total value of ammonia produced by gas works and by-product ovens together, in the year 1905, is given by the United States Geological Survey as $2,775,000. Figures are not available showing the output of the by-product ovens alone.

This ammonia is sold in the form of crude ammonia liquor, sulphate of ammonia, and aqua ammonia. The first named is an impure solution of the ammonia gas in water, containing some light tar oils, sulphur compounds, carbonates, etc., and contains from 15 to 25% of ammonia. It is used in the ammonia soda industry, and also as a raw material for manufacturing higher grades of ammonia such as the nitrate and carbonate of ammonia, etc. Sulphate of ammonia, which is a grayish white crystal, containing about 25% of ammonia is largely used as a fertilizer, and also somewhat for the manufacture of anhydrous ammonia. In Europe the use of sulphate of ammonia as a fertilizer has been very greatly developed, partly by active educational methods, bringing home to the farmer the great gains from its use. It divides with nitrate of soda the responsibility for the great sugar-beet crops of continental Europe, and a great deal of study has been given to the intelligent application of this most available form of nitrogen to the varying crop conditions there found. In this country the development of the use of sulphate of ammonia as a fertilizer has only begun. While figures are not available showing the amounts of ammonia consumed in all the various uses, yet the following table will be of interest, showing a comparison of the ammonia productions of the several leading countries in the year 1906. This table is from a paper by Mr. C. G. Atwater in the last issue of the Mineral Industry. The figures represent all ammonia products figured as sulphate.

ESTIMATED AMOUNT OF THE WORLD'S PRODUCTION OF AMMONIA IN 1906.

	Metric Tons.
England	279,000
Germany	235,000
United States	68,000
France	49,100
Belgium and Holland	30,000
European and other countries	55,000
Total	716,100

When we consider that the production of sulphate in this country was only 25,000 tons and that about 23,000 tons were imported during the year, the meager consumption of sulphate in this, the greatest of agricultural countries, is very striking. While, of course, the newer farming lands are still unimpoverished and do not require fertilizing, yet in all the older States crop yields have fallen off very greatly during the past generation, and yet the present use of artificial fertilizers is mainly confined to the Southern States on the cotton and tobacco fields. A consideration of our acreage of tilled land compared with that of Germany, for instance, will show the possibilities of the use of sulphate when our agricultural colleges and government agricultural stations have educated the farmers up to a full realization of the importance of this invaluable plant food. Aqua ammonia, which is essentially a purified solution of ammonia gas and water, containing about 25% ammonia, is the refined "ammonia" of commerce, although usually purchased in a very diluted form. During recent years its use has grown very rapidly for refrigerating purposes, both as aqua ammonia and as the source of anhydrous ammonia. The latter product is made essen-

-tially ... driving the ammonia gas off from the water by h... drying it and condensing it into a liquid by pres...

Th... ...lus gas from the by-product oven is the portion ... ...ining after sufficient gas has been used for hea... ...e ovens and the amount varies greatly with the ... ...used. In lean coals, low in volatile matter, ther... ...ht perhaps be no surplus, while in rich gassy coal... amount may be from 4,000 to 4,500 cu. ft. per net ... coal. As stated above, this gas is essentially sim... that made in gas works. Following is a typical ... ...sis:

	Per cent.
... dioxid	1.3
...ne	1.2
...ne	4.2
...n	0.5
...n monoxid	5.1
...ane	35.5
...ogen	48.0
...ogen	4.2
...T. U. per cu. ft., gross	679

If ... gas is desired for sale for illuminating purposes and ... richer portion is reserved for this purpose, as described above, the gas is richer in marsh gases and illuminants and contains less carbonic oxygen and hydrogen than the average made. The calorific value of the gas may vary from 550 to 700 B. T. U. per cu. ft. In this country its use for illuminating purposes has been developed much more than in Europe. There are now eleven plants supplying illuminating gas regularly for city consumption, and in 1905, 9,732,000,000 ft. were sold, compared with 30,722,000,000 from coal gas works. In Europe the surplus gas has been largely consumed in gas engines. At one time there was some trouble on account of preignition of the gas, which was laid to the high percentage of hydrogen. This has been overcome, however, and the leading engineers no longer consider it an obstacle to its use for this purpose. It has been shown by Mr. Pennock in the "Journal Society of Chemical Industry," June 15, 1905, that when coke oven gas is mixed with the proper amount of air for combustion, the mixture has not as high a percentage of hydrogen as producer gas, for example, which is largely used in engines without trouble from this cause.

Benzol is recovered from coke oven gas very largely in Europe, and is the raw material for the synthetic manufacture of the anilines and of carbolic acid, as well as a number of other chemical products. It forms the principal illuminant in coal gas, and its use is growing in this country as a convenient source of candle power, enrichment especially in small gas works. It is also used in the manufacture of varnishes.

Benzol has been used experimentally to a considerable extent both in Europe and in this country in explosion engines, both alone and mixed with alcohol. A series of carefully conducted tests in this country on stationary engines, motor boats and motor cars have brought out several points in its favor as a fuel for such engines. An equal volume has about 12% more calorific value than ordinary gasolene. Owing perhaps to the fact that benzol is distilled within closer limits than gasolene, it has a somewhat higher thermal efficiency, and is not so liable to miss fire in the cylinder.

After this general review of the subject the question remains—What is to be the development of the by-product oven in this country? Compared with many industries its growth has been slow, but this, as has been pointed out, is largely due to the condition of the chemical industries in this country, which must of necessity keep pace, at least in a measure, with the sources of their raw materials. The capital required in the installation of the by-product oven is relatively large, and the results would have been serious if the rate of oven building had been greatly in excess of the demand for its by-products. In all industries depending upon the by-products of coke a promising future is apparent. The use of gas for illuminating purposes has become firmly established, and the rapid introduction of the gas engine affords a market for fuel gas. The various uses of ammonia in the arts have already been discussed. But we must look to agriculture as the principal consumer of any largely increased production of ammonia. Through the growing influence of Government and State Experimental Stations and agricultural colleges, science is being applied more and more to agriculture, and this cannot but lead to the general use of artificial fertilizers which naturally follows a higher standard of farm work. As a fertilizer base, sulphate of ammonia, with its nitrogen in the most available form, plays a most important part.

During the last few years the production of tar has exceeded the demand, so that large quantities have had to be burned as fuel at low prices, but the outlook for this by-product is more favorable than it has been. While it may be some time before the highly specialized chemical industries for the production of anilines and dyes have reached any important growth, yet the prospects for the development of the cruder tar products are encouraging. The rapidly increasing price of lumber is forcing the necessity of creosoting, with the attendant consumption of creosoting oil, onto large lumber users like the railroad companies.

The practical start in the commercial manufacture of briquettes which has been described, promises an early development of that industry, and a very modest position as a producer of fuel would mean consumption of a large amount of pitch. If the number of by-product ovens and the output of tar therefrom were doubled, a production of less than 3,000,000 tons of briquettes per annum would consume all the pitch from this increase, without providing for any growth in the important roofing and paving industries, and without providing for any consumption of tar in the new tarred roads. This tonnage of briquettes, compared with the 60,000,000 tons of anthracite which will probably be produced this year, and the 340,000,000 tons of bituminous coal mined in 1906, suggests that briquetting, when once established, even as an "infant industry," may soon reach the condition which exists in continental Europe, namely, where its growth would depend only upon the available supply of pitch. Briquetting pitch must always be sold at a moderate price, unless the conditions of our fuel supply change materially. But, as in Europe, when once developed, briquetting will probably be the principal consumer of the pitch produced in this country.

The by-product oven belongs to the present day. The production of coke at the blast furnace plant, where the operation is assured by large storage of coal and where the labor is under better control than in less developed regions, is in line with today's manufacturing methods. The higher economy of its operation, its special adaptation to control by the modern scientific organization, the ability to draw coals from several fields, and the successful adaptation of labor saving appliances to its various operations, all point to its being the oven of the future.

STUDIES OF THE POLLUTION OF THE ALLEGHENY, Susquehanna and Black River drainage areas are briefly reported in the July bulletin of the New York State Department of Health. The abstracts are from extensive reports submitted by the Engineering Division of the department named. In the case of the Allegheny River, it is recommended

that no discharge of crude sewage from any new sewer system be permitted unless it has first been treated in proper disposal works and that the villages which are now discharging raw sewage into the waters of the main stream or its tributaries should introduce means of sewage purification as rapidly as possible and practicable. The discharge of industrial wastes from new industries into the streams should be forbidden as also the increase of discharges from existing industrial plants unless suitable means are provided for the purification of such wastes.

The recommendation for the Susquehanna drainage area is that all municipalities

having public sewer systems should establish complete sewage purification plants and that factories and manufacturing establishments discharging deleterious matter into the streams should be required to treat such wastes before discharge so far as is practicable in the light of our present knowledge of purification of the respective classes of wastes.

For the Black River drainage area, the advice given is that no discharge of crude sewage from any new sewer system above Watertown should be permitted without adequate treatment by a disposal plant, and also that the sewage now being discharged above Watertown from all systems be purified.

A 160-MILE PIPE-LINE WATER DISTRIBUTION SYSTEM ON THE EL PASO & SOUTHWESTERN RY.

The economy in boiler repairs and locomotive service which results from the use of good water in the boilers has been proved so conclusively that the use of water-softening plants at railway water stations has become very general. In certain sections of the country, however, the character of the water is such that it cannot be treated satisfactorily or economically, and the only means of relief lies in securing a better quality of water from some other source. One of these exceptional cases is on a division of the El Paso & Southwestern Ry., running from El Paso, Tex., northeast across New Mexico to a connection with the Chicago, Rock Island & Pacific Ry. Here a supply of water is obtained in the mountains, at a distance of 34 miles from the railway. This is led by a gravity pipe line to the railway and then distributed for 128 miles by pumping through a pipe line laid along the right-of-way and connected to the water tanks at the various stations. This interesting railway water supply system was planned and built under the direction of Mr. J. L. Campbell, M. Am. Soc. C. E., Engineer of Maintenance of Way, El Paso, Tex. We are indebted to Mr. Campbell for plans and information from which the following description has been prepared.

Fig. 1. Map of Pipe Line for Distributing Water along the El Paso & Southwestern Ry. between Carrizozo and Santa Rosa, N. M.

The division in question extends from Carrizozo, N. M. (144 miles from El Paso), northeast to Santa Rosa, N. M., a distance of 128 miles. The water supply for the entire operation of the division has been obtained from deep wells. The average quality (and even the best quality) of water supplied by these wells is said to be worse than that of any railway in the United States from which records have been obtained. The use of this supply has been made possible only by softening the water as far as possible by the lime and soda-ash treatment. After treatment the water is still so bad that there is an excessive charge against it on account of reduced train tonnage, engine failures and engine maintenance.

Table I. shows the character of the water treated at the several water stations, with the chemicals used and the results of the treatment. Table II. gives the chemical analyses of the water obtained from wells at Santa Rosa, at mile-post 199, and at Pastura.

In addition to the bad quality of the water and its inferior quality even after treatment, it did not appear practicable to continue to develop sufficient additional quantities of this well water to keep pace with the growing business of the railway. The wells are all deep, several of them being from 900 to 1,100 ft. in depth. They have been operated almost exclusively by a system of deep-well pumps, and Mr. Campbell states that the maintenance and operation of these has proved to be an expensive, troublesome and uncertain element. The total operating expense directly and indirectly due to this most unsatisfactory water supply amounts to 98 cts. per 1,000 gals. The new water supply, although involving the expenditure of a large sum of money, will have a charge not exceeding 16 cts. per 1,000 gals. That its quality is exceedingly good may be seen from the analysis given in Table III. While the water from the deep wells has from 10 to 26 lbs. of incrusting solids per 1,000 gals., the water from the creek has but 0.707-lb. per 1,000 gals.

Early in 1907, Mr. Campbell was requested by the management to investigate the possibilities of finding and developing a new supply of water that would be acceptable in quality and of ample quantity. Such a supply was found in Bonito Creek, at the foot of the White Mountain, 16 miles in a direct line across the mountains and south of Carrizozo. The distance by the wagon roads, and on the only practicable route around which the water could be diverted and brought over to the railway, was 24 miles from Carrizozo, or 34 miles from Coyote (14 miles east of Carrizozo). This latter is the point at which the main pipe line actually reaches the railway. The pipe line then runs along the track to Santa Rosa. The total distance from Coyote is 116

miles, and the total distance from the point of diversion on Bonito Creek to Santa Rosa is 148 miles. The direction is shown by the map, Fig. 1. Carrizozo is a division point, and from a point on the main pipe line a branch line six miles long is run to that place. This supplies water for the division terminal.

The elevation of White Mountain is 12,000 ft.; the point of diversion on Bonito Creek about seven miles from the summit is 7,750 ft. The elevation of Coyote, where the pipe line reaches the railway, is 5,800 ft. From Coyote, the railway begins to climb the mountain divide separating the Rio Grande basin from the Pecos River drainage area. The summit is at Corona, 37 miles east of Coyote, and at an elevation of 6,725 ft. From Corona, the railway drops down steadily to Santa Rosa, at an elevation of 4,600 ft. The water flows by gravity from the point of diversion on Bonito Creek to the railway at Coyote. From this point it is pumped up the hill through an elevation of 925 ft. and a distance of 37 miles by two pumping plants. One is located at Coyote, at the foot of the hill; the other is at Luna, half way up to the summit. The working pressure against the pumps (including friction) is from 300 to 310 lbs. per sq. in.

The formation of White Mountain, and the country surrounding Bonito Creek at and above the point of diversion of the water, is almost exclusively granite and porphyry. The stream is fed by the heavy annual snowfall on the heavily timbered mountain slopes and gorges. This is the cause of the exceedingly good quality of the water. The total solids average about 7 grains per gal., and the incrusting solids between 4 and 5 grains per gal.

The flow of Bonito Creek at the point of diversion varies from 1 cu. ft. per sec. for a short period in the middle of the summer, to 40 cu. ft. per sec. in the latter part of the winter and early spring. A quantity of water equivalent to 2.5 cu. ft. per sec. for the entire year will be diverted for the use of the railway. The diversion to the pipe line is made by means of a weir and sand-catcher or sand-box. These head works are built of reinforced concrete, and are shown in Figs. 2 and 3.

About 11.5 miles below the intake, and at the edge of an elevated plateau or tableland, is the Nogal Reservoir, which is formed by a sharply defined natural basin. It will have a capacity of 422,000,000 gals., with a depth of 35 ft. and a surface area of 156 acres. The capacity can be increased to 1,000,000,000 gals. by work involving only a very reasonable cost. The elevation of the water surface will be about 7,150 ft. above sea level. The upper section of the pipe line discharges into one side of the reservoir, while the lower section begins on the opposite side. A 10-in. by-pass extends around the reservoir, from the 16-in. delivery main on one side to a connection with the 10-in. outlet pipe on the other side. The passage of water through this by-pass is controlled by a gate valve. In Fig. 4 are shown the inlet and outlet chambers.

The pipe line varies in diameter from 7½ to 16 ins., depending upon the slope of the hydraulic grade line. From the Bonito Creek intake a 10-in. pipe extends about 2.5 miles, with a hydraulic grade of 3.3%. At the bottom of the grade is a stand-pipe. A 16-in. pipe then continues for about 9 miles to the reservoir, the grade here being about 0.3%. From the outlet there is a 10-in. pipe for about a mile, followed by six miles of 7½-in. pipe having a hydraulic grade of 3.3%. The remaining stretch of 16 miles to the end of the gravity pipe line at Coyote is of 12-in. and 11-in. pipe, with a hydraulic grade of 0.3%. The five-mile branch to Carrizozo is of 5-in. pipe, with a hydraulic grade of 1.645%.

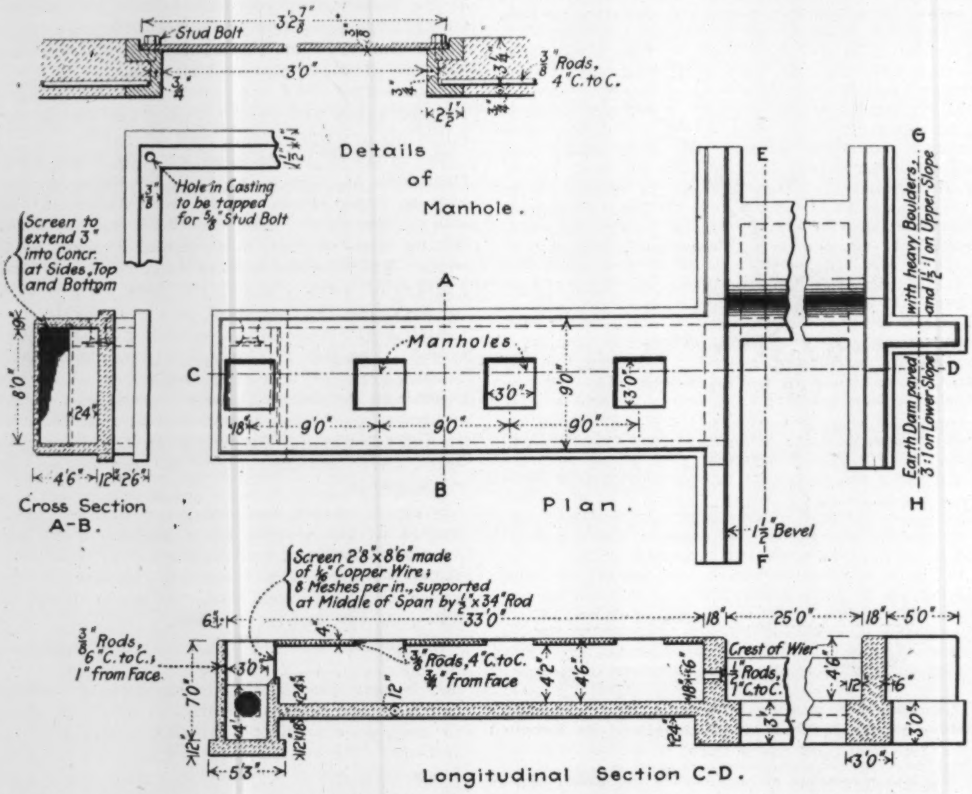
During the low-water season in the middle of the summer the maximum daily flow of Bonito Creek will be (eventually) insufficient for the daily consumption of the railway. In order to tide over this period, the upper section of the pipe line (from the intake to the reservoir) has a flow capacity of 5 cu. ft. per sec. For the lower section, from the reservoir to the railway, the pipe-line capacity is 2.5 cu. ft. per sec., which is the estimated maximum future daily consumption of this division of the railway. This future daily consumption is assumed to be three times the present requirements. In other words, it is estimated that this new supply of water will handle something over three times the present large volume of business being done. During the winter and spring seasons the upper section of pipe, between the point of diversion and the storage reservoir, will deliver to the reservoir a surplus of not less than 2.5 cu. ft. of water per sec., over and above the daily consumption of the railway. This surplus will be stored as a reserve to draw upon during a portion of the summer time when the daily flow of the stream is insufficient. The reservoir in its natural condition will hold a reserve water supply sufficient to run the railway for eight months without any supply from the creek.

The pipe line is provided liberally with air valves and blow-off valves, and also with a number of gate valves and relief valves. This equipment is sufficient to control the flow of the water and keep the pipe full during the period of minimum flow in the creek, when the discharge of the latter will be insufficient to keep all sections of the pipe full and under pressure without the assistance of this system of valves. In addition to this, at the bottom of each of the two sections of heavy grade (3.3%), there are open stand-pipes which will automatically regulate the flow of water and prevent accumulation of pressure at those points when the pipe line is flowing full under normal conditions. Some details of the valves and stand-pipes are shown in Fig. 5.

At Coyote and at Luna, where the pumping stations are situated, there are artificial reservoirs of a capacity of 2,500,000 gals. each. There will be a similar reservoir on top of the mountain divide where the water begins to flow by gravity from the summit down to Santa Rosa, a distance of 87 miles. Another similar reservoir will be built at Carrizozo, at the end of the branch pipe. Fig. 6 is a view of the Carrizozo reservoir, with the concrete lining being placed. The construction of the reservoir at Coyote is shown in Fig. 7, and the others are of practically the same design. They are formed by embankments faced with concrete. They are 100 x 200 ft. on the bottom, with side slopes of 1 on 1½, and a water depth of 12 ft.

Each reservoir is connected simply to the pipe line main by a tee and branch pipe passing into the bottom of the reservoir. It receives the surplus water that is delivered in excess of the rate at which it is pumped or consumed at the point of delivery. Under normal conditions the pumps are fed directly both by the main pipe line and by the reservoir. If for any reason the supply main should not be delivering water as fast as the pumps take it at Coyote, or at Luna, or if the consumption at any time at Carrizozo should be greater than the momentary delivery of the pipe line to that point, the deficiency for the time being is immediately supplied by the reserve in these reservoirs. They will store a reserve supply sufficient to run the entire division of the railway for one week. They thus allow this length of time for repairing any break in the gravity pipe line from the main storage reservoir on top of the tableland.

Wherever the supply main along the railway passes a service water tank at the water stations, a 4-in. branch pipe is taken off the main, carried into the bottom of the tank and then up inside the tank. This is capped by an automatic float valve, which cuts off the supply whenever the tank is full and also opens up the supply from the pipe main whenever the water in the tank falls below a fixed point. The service tanks



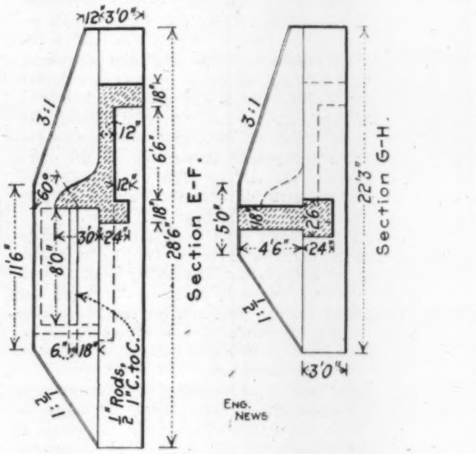


FIG. 2. WEIR AND SAND-CATCHING CHAMBER AT INTAKE OF PIPE LINE ON BONITO CREEK.

will, therefore, normally stand full of water, and any water drawn from the tank will be immediately replaced by a flow from the supply main. The arrangement of this service connection to the tanks is shown in Fig. 8.

After the general character and features of the project were developed as above outlined, the question of the kind of water pipe to be used was

Fig. 3. Intake of Pipe Line on Bonito Creek.

discussed very thoroughly. This resulted in the selection of wood-stave pipe, on the basis of first cost and probable durability. The pipe selected for the first contract from Bonito to Coyote is made by the Wyckoff Wood Pipe Co., Elmira, N. Y. This pipe is made of Canadian white pine, and is wound with flat steel bands. The bands and entire exterior of the pipe are very thoroughly covered and protected by a coat of asphalt. Each section of pipe as soon as it comes from the asphalt bath is rolled in sawdust; this adheres to and completely hides the asphalt coating. This pipe is made in sections having a maximum length of 8 ft., and has a hub and tenon joint which is simply driven together in the trench. Provision is made for reinforcing the joint under high pressures. This type of pipe has been used during the last 50 years, and Mr. Campbell refers to records showing durability in useful service extending over periods ranging from 25 to 40 years.

The pressures under which this pipe is being laid and will be required to work range from 5 to 130 lbs. per sq. in. For the last named pressure, the pipe is wound solid with the steel band. Kutter's and Darcy's formulas were used and checked against each other in proportioning the various diameters of the pipes to the various hydraulic grade lines under which they would work. It is considered that a wood pipe 11 ins. diameter will carry as much water as a 12-in. iron pipe. It is considered also that the carrying capacity of the wood pipe will not diminish, whereas a considerable decrease in the capacity of the iron pipe (even considered as a rough pipe) may be expected at some time in the future. Considering the difference in cost it was estimated that the wood pipe could be renewed once in ten years and still be an economical investment. The engineers, however, had reason to believe that they would get a useful life of at least 25 years from the wood pipe. The cost of the wood pipe for this project will be not more than half that of cast iron pipe. Steel pipe of required weights and strength would cost approximately the same as iron pipe.

Some of the cast-iron specials used on the wood-stave pipe line are shown in Fig. 9. The tenons of the wood pipe are driven into the hub ends of the specials, while the flanged ends of the latter receive the valve connections, etc.

On all other sections of the pipe line, both behind Coyote and beyond Corona, the water flows entirely by gravity. Beginning at Corona, the gravity supply main down-hill starts with a wood pipe 8⅞ ins. diameter. The diameter decreases as each water station is passed, or as the grade increases, until a diameter of 3½ ins. is reached on the last six miles of the pipe line.

Wood pipe is not used, however, on all of the pressure line from Coyote to the top of the divide at Corona, on account of the exceedingly high pressures on the lower ends of the two sections of this pump main. The pressure on the wood pipe is limited to 130 lbs. per sq. in. This necessitates laying two ten-mile sections of cast-iron pipe, beginning at each pumping station and running up the hill to the points where the pressures will be admissible for wood pipe. The total pressure on the pumping main at the pumps, due to static head and resistance, will be from 300 to 310 lbs. per sq. in., or approximately equivalent to a static head of 700 ft.

The two pumping stations will be equipped complete with Nordberg pumps and Stirling water-tube boilers, both in duplicate. Each pumping unit in each installation has a capacity of 1,000,000 gals. per 24 hours, and a guaranteed duty of 135,000,000 ft.-lbs. per 1,000 lbs. of steam. The estimated cost of lifting the water from Coyote to the top of the hill at Corona, is 4 cts. per 1,000 gals.

The following additional information has been received recently from Mr. Campbell. In connection with the tests of velocity and capacity of flow of water by means of coloring matter thrown into the water, reference may be made to the use of a similar method in tests of the Kinnickinnic River flushing tunnel at Milwaukee, Wis. (Eng. News, April 23, 1908.)

Pipe Line Construction.

By J. L. CAMPBELL.

The pipe line is completed from the source of supply on Bonito Creek to the railway at Coyote, and delivery of water commenced a few days

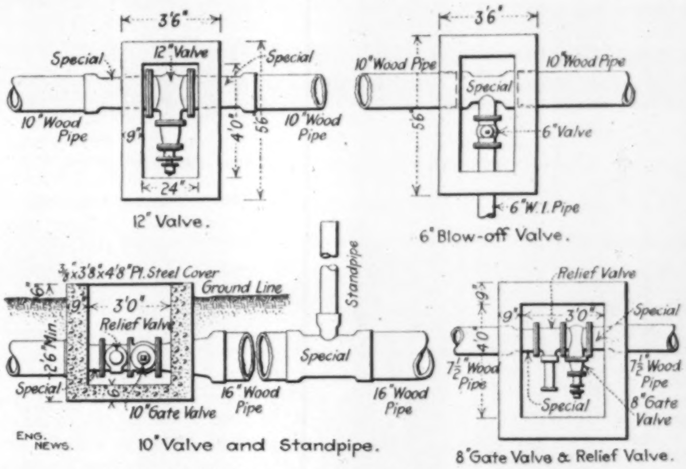


FIG. 5. VALVES AND STAND-PIPES ON PIPE LINE.

prior to Feb. 1, of this year. Pending the completion of the pipe line along the railway from Coyote to Santa Rosa, the water is being hauled in water trains and distributed to the water stations where the old supply is superseded by the new.

The improvement in operating conditions since Feb. 1 has been marvelous. In making the original report upon this project, the writer estimated that the increase in train tonnage to be expected from the new water supply should be not less than 25%. Our engines to-day are hauling regularly 33.3% more tonnage per train than could be obtained prior to that date. Trains are now regularly on time and the immense relief afforded to trainmen and to dispatchers has made those employees happy and contented.

The reduction in operating expenses already indicates that the cost of the new water supply will be entirely repaid thereby in 18 months. With the old water supply, engines had to be washed out at the end of each run and tubes had to be renewed every two, three or four months. Now engines run for weeks at a time without washing. New tubes, put in since the new water supply was introduced, will last for several years.

The total length of the pipe line as it has been completed to the railway from the source of supply on Bonito Creek, including the branch to Carrizozo, is 37 miles. This pipe had to be hauled out and laid across country, some of which is quite rugged. The lower half of the line lies across an open plain (Fig. 10) where conditions of construction were favorable. The maximum haul on the 16-in. line on the mountain section was 18½ miles. Being in a great hurry to complete the line we had at one time 200 teams hauling pipe. About 60,000 ft. of this was hauled from the railway and distributed along the trench at the rate of three miles per day. The last ten miles of the pipe line was laid in seven days, during which time six different pipelaying gangs with ditching gangs and ditching machines were at work. After the trench was opened, a gang of six men laid the pipe at rates varying from 1,000 to 4,000 ft. per day, depending upon the size of the pipe and

FIG. 4. INLET AND OUTLET CHAMBERS AT NOGAL RESERVOIR ON THE PIPE LINE.

the character of the country. Wood pipe, being comparatively light and the joint being a simple chamber and tenon connection, is very rapidly driven together in the trench. On account of the mildness of the climate, the pipe was laid with a minimum depth of 1 ft. from the surface of the original ground to the top of the pipe in the trench.

As indicated farther on, this wood pipe line has proved to be remarkably tight, the leakage being very small considering the maximum pressure of 130 lbs. per sq. in. This tightness was secured largely by introducing bran into the upper end of the pipe at the intake on the creek. Experiments and tests covering the feature of leakage during the time the pipe was being manufactured had determined that, for short lengths, water tightness could be secured by the use of bran in the water. It was still a question if bran could be successfully carried through a pipe line 32 miles long and be made to stop leaks at the lower end. There was no trouble in doing this, and the leaks at the lower end were promptly stopped in this way.

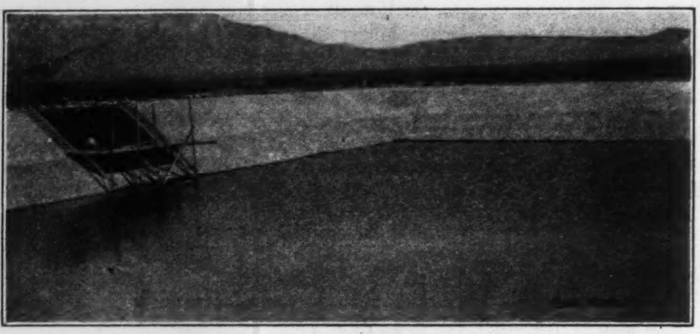


FIG. 6. THE RESERVOIR AT CARRIZOZO, N. M.; SUPPLIED FROM THE PIPE LINE. EL PASO & SOUTHWESTERN RY.

It is altogether probable that the large initial leakage which took place in the pipe line immediately after it was laid would have practically stopped in the course of a few months, due to the gradual swelling of the wood and tightening of the joints. However, the process was hastened (in fact stopped in 12 hours) by the use of the bran.

Some large leaks and many small ones have opened in the pipe line from time to time, during the four months it has been in operation. These are very quickly and inexpensively stopped by pine wedges. Generally, such leaks occur at the joints, and are due, apparently, to the gradual settlement and adjustment of the pipe in the trench. In a few cases, imperfect knots have blown out between the bands of the pipe, but these holes have been stopped easily by pine plugs. The pipe is made of Canadian white pine and it is practically impossible to secure clear stuff out of that class of lumber. Consequently we had to accept a good many knots. The material was very carefully culled at the factory, and loose or imperfect knots were excluded as far as possible. Evidently it was not practicable to exclude every one of them. Except for the knots, the Canadian white pine is a superior quality of wood for pipe work.

In addition to this, there has been some trouble from the pulling apart of a few of the riveted splices in the flat steel band with which the pipe is wound. It has been ascertained that this defect arose from the physical and mental condition of one of the men in charge of the riveting at the factory. This is supported by the fact that these breaks in the splices were localized in practically one place on the pipe line, and an examination of the breaks showed that they were due to defective riveting. In future, the writer will require that the riveting be eliminated and the splicing done by a thorough weld.

It is remarkable that notwithstanding each section of pipe is spirally wound continuously from end to end, the pulling apart of the splices in the band which failed (as above noted) has not, in any case, resulted in a rupture or blowing out of the section of pipe on which such break occurred. The pipe has simply swelled sufficiently to produce a very bad leak, the winding of the bands generally loosening for only three or four turns around the pipe. It has been necessary merely to put individual iron bands around the broken part and tighten them up. The tenacity with which these spirally wound bands adhere to the pipe is accounted for by the tough and heavy coat of asphalt in which they are embedded, and the very high frictional resistance which is thereby set up between the surface of the wood and the band.

Attempts to blow up the pipe line have given a further indication of this. Some miscreants have, on four different occasions, dynamited the upper section of the pipe line on Bonito Creek, each time blowing a hole into the pipe. In no case have these charges of dynamite broken up a length of pipe greater than 3 ft., and the winding of the band and its adhesion to the surface of the pipe has not been disturbed for a distance greater than 18 ins. back of the end of the break. In three of the cases of dynamiting, it was necessary to take out only one section of the pipe. In the fourth case, the charge happened to be placed directly on a joint, and there two sections were broken. In each of these cases, the pipe was repaired and in service within three or four hours after the break was reached. With the exception of these breaks due to the dynamite, we have not as yet had to remove any of the 40,000 pieces of pipe which went into the pipe line. In one case only has a band broken on account of defective strength. This break was caused by a thin place in the band, resulting (apparently) from imperfect rolling.

TESTS OF THE CARRYING CAPACITY OF THE PIPE LINE.

Regarding the carrying capacity of the pipe line, the following letter will be of interest. This was written to Mr. T. Chalkley Hatton, M. Am. Soc. C. E., the Consulting Engineer to the Wyckoff Wood Pipe Co., the manufacturers of our wooden pipe.

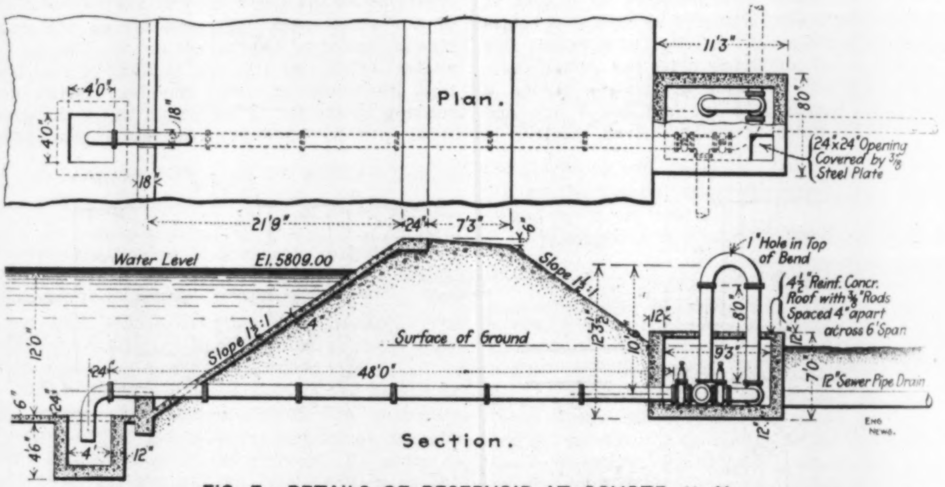


FIG. 7. DETAILS OF RESERVOIR AT COYOTE, N. M.

The first test was made on March 10. Bran had been introduced into the pipe line on several occasions for the purpose of stopping leaks (which it did very effectively), and it was incidentally noted that it required about four hours for the bran to travel through the pipe from the intake to the Nogal Reservoir.

This suggested a simple and accurate means of determining the velocity of flow in the pipe. Consequently, I had a quantity of bran poured into the intake and the time elapsing until it appeared at the Nogal Reservoir was carefully noted. It was found that it required 3 hrs. 50 mins. for the water to flow through that section of pipe, which consists of 13,200 ft. of 10-in. pipe working on an hydraulic grade having a fall of 33⅓ ft. per 1,000, and 47,500 ft. of 16-in. pipe working on an hydraulic grade having a fall of 3 ft. per 1,000. This test gave the information necessary to determine the rate of flow in, and consequently the carrying capacity of, the two sections of pipe. The velocities of flow are derived as follows:

Area of 10-in. pipe in sq. ft.	0.5454
Area of 16-in. pipe in sq. ft.	1.3960
Length of 10-in. pipe in ft.	13,200
Length of 16-in. pipe in ft.	47,500
Time in seconds	13,800

Let x = velocity of flow in ft. per sec. in 10-in. pipe
Let y = velocity of flow in ft. per sec. in 16-in. pipe
then, $0.5454\,x = 1.396\,y$

$\therefore x = 2.56\,y$

then, $\frac{13,200}{x} + \frac{47,500}{y} = 13,800.$

Or expressing x in terms of y,

$$\frac{13,200}{2.56\,y} + \frac{121,600}{2.56y} = 13,800$$

then, $35,428\,y = 134,800$

$\therefore y = 3,805$, and $x = 9.74$.

These actual velocities of x for the 10-in. and y for the 16-in. pipe give an actual discharge of 5.31 cu. ft. per sec. for both the 10-in. and 16-in. pipes.

The calculated and anticipated discharge in fixing the diameters and grade lines of the pipes, as deduced from Darcy's formulas for smooth pipes, was 5 cu. ft. The actual discharge is, therefore, 6% in excess of the calculated quantity. These wood pipes are properly classed as smooth pipes.

Darcy's formula, taking his coefficient "c" equal to 0.00033, gives a velocity of 9.17 in the 10-in. pipe and a velocity of 3.48 in the 16-in. pipe. This is from 6% to 9% less than the actual discharge.

Kutter's formula, with "n" equal to 0.01, gives velocities of 9.49 and 3.79, respectively. This is from 3% to 0% less than the actual discharge.

While the bran could not travel faster than the water, there is a possibility that the average rate of travel of the water may have been very slightly greater than that of the suspended bran. The difference is probably immaterial, as the larger and lighter flakes of bran were kept very uniformly suspended and distributed throughout the sectional area of the pipe by the flow and agitation of the water.

The test above described consisted simply in putting the bran into the head of the 10-in. pipe and noting its appearance at the end of the 16-in. pipe. This observation gave the necessary basis on which to compute the relative velocities in the 10-in. and 16-in. pipes as set forth above.

The second test, which was made on March 31, was conducted as follows:

An observer was stationed at a relief valve on the 10-in. line 12,700 ft. below the intake at the weir, and another observer was placed at the end of the 16-in. line. The relief valve was opened to permit a small stream of water to escape, and the observer noted the time at which the various colors and the bran appeared in the water issuing from the valve.

The test was made by using a pint of green aniline (hereinafter called green) dissolved in a gallon of water; a half pint of potassium permanganate (hereinafter called red) dissolved in a gallon of water; and 30 lbs. of bran.

The two colors and the bran were started into the head of the 10-in. pipe and reached the relief valve 12,700 ft. below, as follows:

	Started.	Arrived at valve.
Green at	8:30 a. m.	8:520 a. m.
Red at	8:45 a. m.	9:06½ a. m.
Bran at	9:00 a. m.	9:22 a. m.

This gives a mean time of 21.833 mins. or 1,310 secs. to travel 12,700 ft., or, at the rate of 9.695 ft. per sec. This required 1,362 secs or 22.7 mins. to flow through the 13,200 ft. of 10-in. pipe.

The green and the bran reached the end of the 16-in.

at 12.22 p. m. and 12.51 p. m., respectively. The color had become so faint that its arrival at the end of the 16-in. pipe could not be timed satisfactorily. While a trace of red seemed to appear at 12.37 p. m., its observation is not included here.

From the above, the green traveled from the head of the 10-in. pipe to the end of the 16-in. pipe in 3 h. 52 mins. The bran traveled the same distance in 3 h. 51 mins., giving a mean time of 3 h. 51½ mins., or 13,890 secs. Since 1,362 secs. were consumed in going through the 10-in. pipe, 12,528 secs. were required for the water to flow through the 47,500 ft. of 16-in. pipe, or at the rate of 3.792 ft. per sec. We have then, measured velocities and discharges as follows:

	Velocity, ft. per sec.	Discharge. cu. ft. per sec.
In the 10-in. pipe..........	9.695	5.287
In the 16-in. pipe..........	3.792	5.293

These results are inconsistent by only 0.006 cu. ft. of discharge per second. They indicate that the observations and deduced averages as given above, are quite accurate:

Applying the formula for equalized relative velocities as derived in my letter of March 12 (and given above) we have:

$$\frac{13{,}200}{2.56\,y} + \frac{121{,}600}{2.56\,y} = 13{,}890,$$

then, $35{,}558\,y = 134{,}800$

$\therefore\ y = 3.791$, and $x = 9.705$.

These calculated relative velocities give discharges as follows:

For the 10-in. pipe.............. 5.293 cu. ft. per sec.
For the 16-in. pipe.............. 5.292 cu. ft. per sec.

These results are practically consistent, and would be entirely so except for dropping decimals in the fourth place. You will observe that the measured velocities and resulting discharges are practically the same as the calculated values.

The bran traveled through the pipe as fast as the color. In fact, the noted time of the bran for the entire length of the pipe on the first test, March 10, was 3 h. 50 mins. On the second test, March 31, the time for the bran was 3 h. 51 mins., while the green was not observed at the end of the 16-in. line until the expiration of 3 h. 52 mins. The green had faded very materially by the time it reached the end of the pipe, while the red color had practically disappeared. It is possible that the thinning out of the coloring in the 12 miles of its travel in reaching the end of the 16-in. line may have rendered it imperceptible until some time after the particles of water with which it had started its journey had actually reached the outlet.

In any event, the experiment appears to prove quite conclusively that the lighter particles of bran have the same rate of travel as the water holding them in suspension. The fact that the bran had distributed itself throughout a greater length of pipe than the coloring is determined by the times at which the color and the bran appeared, and the times required for each to disappear at the end of the 16-in. pipe. The finer, lighter flakes of bran and the milky color appeared first, while the larger and heavier particles lagged behind.

The pouring of the green into the pipe began at 8.30 a. m. and was finished in a period of 2½ mins. It appeared at the relief valve at 8.52 a. m. and disappeared in a period of 3½ mins. It reached the end of the 16-in. pipe, at 12.22 p. m., and disappeared in a period of 3½ mins. The red was poured into the pipe during a period of 2 mins. and it appeared at the relief valve for a period of 2 mins., but it did not appear with any distinctness at the end of the 16-in. pipe. The bran was poured into the head of the pipe for a period of 2 mins. It appeared at the relief valve during a period of 2 mins., but at the end of the 16-in. pipe it appeared for a period of 20 mins. The finer lighter flakes and milky color came first, and the heavier particles last, as above described.

As indicating the accuracy of the observations and the uniformity of flow in the pipe, you will note that on March 10, the bran went through in 3 h. 50 mins., and on March 31, in 3 h. 51 mins., a difference of one minute. The average time of the colors and the bran on March 31 differs but 1½ mins. from the time of the bran test on March 10, the resulting discharges of the pipe being 5.29 cu. ft. and 5.31 cu. ft. respectively. It appears, therefore, that the actual velocities and discharge are 6% in excess of the 5 cu. ft. per sec. which the pipe line was designed to carry.

The actual measured relative velocities and discharges in the 10-in. and in the 16-in. pipe show that there is no material leakage in the line. If there was a leakage sufficient to appreciably affect the velocity in the length of the 16-in. line, it is evident that the average velocity through the 16-in. section would have been less than that necessary to carry through all of the water received from the 10-in. line.

The figures above show that the actual velocity throughout the entire length of the 16-in. line is the actual velocity necessary to carry all of the water received from the 10-in. pipe. As a matter of fact there was some leakage in the 16-in. line, but as far as it could be seen

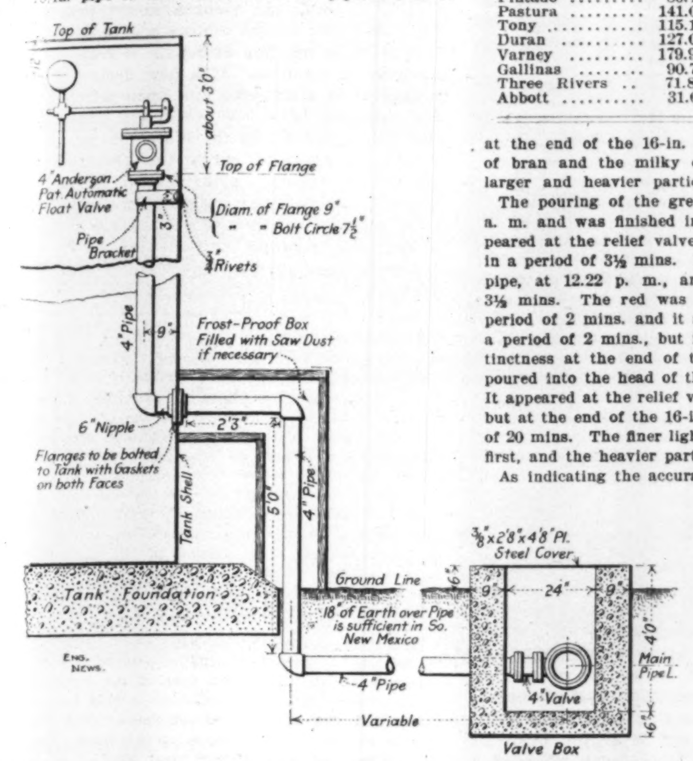


FIG. 8. SERVICE CONNECTION FROM PIPE LINE TO WATER TANKS.

TABLE I.—QUALITY OF WATER SUPPLY AND EFFECT OF TREATMENT ON THE EL PASO & SOUTHWESTERN RY. (BETWEEN SANTA ROSA AND CARRIZOZO, N. MEX.)

Station.	Incrusting Solids. Gr. per U. S. gal. Untreated.	Incrusting Solids. Gr. per U. S. gal. Treated.	Incrusting Solids. Lbs. per 1,000 gals. Untreated.	Incrusting Solids. Lbs. per 1,000 gals. Treated.	Non-Incrusting Solids. Gr. per U. S. gal. Untreated.	Non-Incrusting Solids. Gr. per U. S. gal. Treated.	Chemicals Used, lbs. per 1,000 gals. Soda.	Lime.	Caustic.	Sal-soda.
Santa Rosa	140.12	14.40	20.02	2.06	28.76	235.35	8.41	....	4.30	....
Pintado	80.47	15 to 22	11.50	3.21	9.42	66.94	4.35	....	0.96	2.43
Pastura	141.04	11 to 15	20.14	2.37	6.32	137.36	12.81	2.64	....	....
Tony	115.18	14 to 18	16.45	2.00	10.92	......	10.00	....	2.46	....
Duran	127.00	13 to 15	17.28	.58	54.51	......	12.64	3.14	....	....
Varney	179.95	6½ to 12	25.71	.93	14.12	156.61	16.35	3.83	....	....
Gallinas	90.78	15 to 20.89	12.97	2.98	7.49	95.46	13.89	2.32	....	....
Three Rivers ..	71.87	15 to 18.26	10.27	2.61	13.60	67.77	3.69	....	0.75	2.00
Abbott	31.62	14	4.52	2.00	50.16	......	0.89	....	1.74	....

Fig. 10. Course of Pipe Line across the Plain (The Poles are for the Telephone Line).

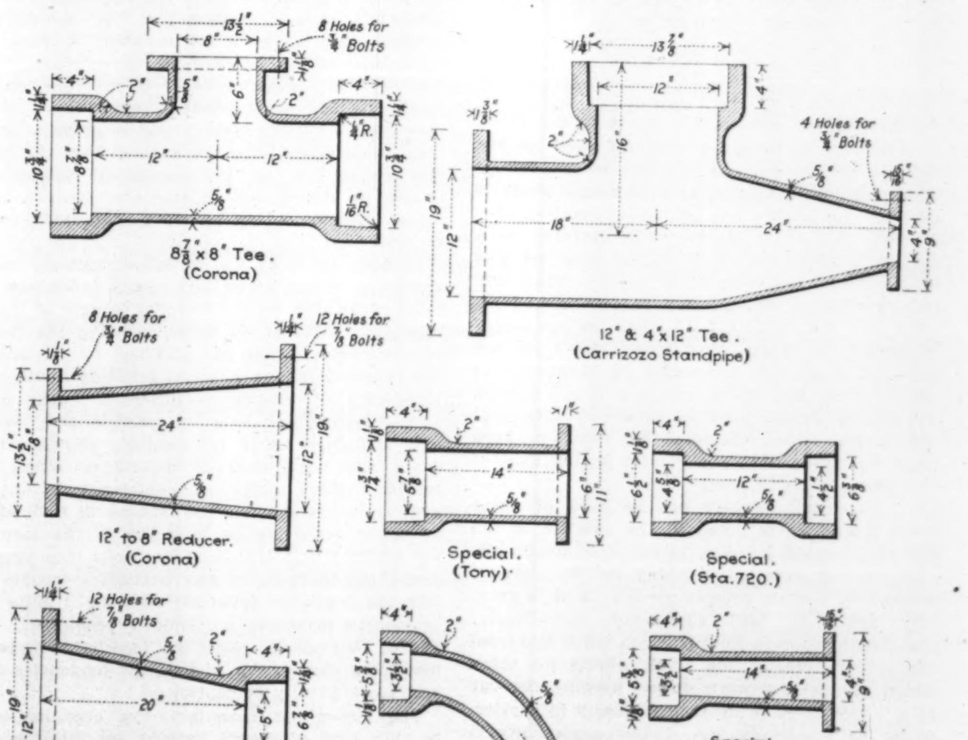


FIG. 9. CAST-IRON SPECIALS FOR WOOD PIPE LINE.

TABLE II.—ANALYSES OF DEEP-WELL WATER SUPPLIES; EL PASO & SOUTHWESTERN RY.

	Santa Rosa Not treated.	Santa Rosa Treated.	M. P. 199. Not treated.	Pastura. Not treated.
Incrusting solids:				
Calcium carbonate	9.90	0.30	10.45	7.70
Calcium sulphate	100.50	none	104.39	104.90
Calcium chloride	none	none	none	none
Magnesium carbonate	none	9.74	none	none
Magnesium sulphate	28.08	none	29.76	23.94
Magnesium chloride	none	none	none	1.95
Iron and alumina	0.12	0.04	0.82	0.77
Silica	1.52	0.47	2.33	1.40
Suspended matter	Trace	3.85	32.20	0.35
Total	140.12	14.40	179.95	141.01
Non-incrusting solids:				
Sodium sulphate	11.79	149.95	9.44	none
Sodium chloride	16.97	19.89	4.68	6.32
Sodium carbonate	none	65.51	none	none
Total	28.76	235.35	14.12	6.32
Alkalinity	10.49	78.12	11.08	8.16
Hardness	108.04	9.90	111.00	......
Carbonic acid	16.85	Not det.	15.32	14.93
Pounds of incrusted solids per 1,000 gals	20.02	2.06	25.71	20.14

TABLE III.—ANALYSIS OF NEW WATER SUPPLY FROM BONITO CREEK FOR DISTRIBUTION BY PIPE LINE; EL PASO & SOUTHWESTERN RY.

Analysis.	Gr. per U. S. gal.	Probably Combined.	Gr. per U. S. gal.
Silica	0.700	Silica	0.700
Oxides of iron and alumina	.474	Oxides of iron and alumina	.474
Calcium oxide	1.365	Sodium chloride	.482
Magnesium oxide	.220	Calcium sulphate	3.315
Sodium oxide	.256	Magnesium carbonate	.462
Sulphuric acid	1.950		
Chlorine	.292		
Carbonic acid	.242		
	5.499		
Less oxygen equivalent chlorine	.066		
Total solids	5.433		5.433

Total incrusting solids, 4.951; equal to 0.707 lbs. per 1,000 gallons.

and examined it would not exceed 5,000 gals. in 24 hrs. on the days when measurements were taken. When it is remembered that much of this line is working under pressures varying from 100 to 130 lbs. per sq. in., this is quite a remarkable result.

The extreme water tightness has been secured by calking the pipe with bran on several occasions, bran having been introduced into the pipe line at the upper end and carried throughout its length by the flow of the water, stopping the leaks as it went. This bran undoubtedly stopped many small invisible leaks. We know it actually did stop visible leaks of all kinds. Many of these were so small that it would have been difficult to stop them by calking, as the opening was not large enough to admit of calking with wedges. In many cases, small leaks would be under a band and could not be got at except by the use of the bran on the inside of the pipe.

MAINTENANCE RECORDS OF POOLED EQUIPMENT: BOSTON ELEVATED RY. CO.

By H. S. KNOWLTON.*

In keeping records of defects and repair cost in connection with the operation of machinery the question of detail early comes to the front. The problem is to decide how far such records shall be subdivided, and this can be determined in specific cases only after a thorough study is made of the present and probable operating conditions. When the equipment is operated on a distinctly individual basis, taking each machine by itself and replacing it by another when any failure occurs, the recording of defects and repairs is a simpler task than when the machinery is pooled. If parts of different machines are substituted in time of trouble in preference to withdrawing the entire machine from service, the record system must be more elaborate, providing for cross references in order to keep track of the location and service at any time of any given machine part.

An excellent instance of the need of these cross references is noted in the practice of the Boston Elevated Ry. Co., in connection with the recording of defects occurring on its elevated trains. In electric railway service there is great opportunity to pool equipment successfully; transferring motors from truck to truck and from car to car; substituting fresh wheels for those which are getting worn down; keeping the car as a whole in each instance regularly in service, so far as practicable. A similar opportunity is open to the manufacturer using a large number of electrically-driven machine tools, where the substitution of the spare part in preference to the withdrawal of the entire machine enables the tool service to be practically continuous. The amount of capital invested in a modern large machine tool is too much of a factor in the fixed charges to justify a narrow policy in most industries in regard to the purchase and storage of extra parts.

*23 Richardson St., Newton, Mass.

In the case of the Boston Elevated Ry. the expected severity of the service and the many new problems which had to be solved by experience in actual train operation made it necessary for the company to plan unusually thorough means of keeping records of the behavior of its rolling stock. The card index afforded a ready and flexible method of filing the results of the daily operation, based upon the reports of the inspectors on the road, of the shop inspection organization and of the heads of the different shop departments. By means of these records and their interpretation the company has been able to reduce considerably the number of defects occurring in service. The application of a somewhat similar system on the company's surface lines reduced the number of failures some 50% in the last two or three years. On the elevated lines, however, there were many more new and unprecedented problems to solve than on the surface system, and in order to provide for properly filing the data so that the service capabilities of the equipment might be learned in detail, and in terms of its life, the record system had to be more thoroughly subdivided.

To keep track of the pooled equipment, each armature, motor, truck and car is given one or more cards showing the location of each of these important parts at all times, showing the dates of changes from one car or truck to the other, the causes of changes, wheel-grinding dates, assignments of motors to different trucks and cars, showing car lists by number and motor and armature cards by number, showing the dates and particulars of defects occurring in service. Each piece of equipment is given monthly cards showing the number of each kind of defect occurring on any day in the month. By summarizing the monthly cards into yearly cards, the tendency of any particular trouble to increase becomes apparent and the results of preventive measures are equally prominent. In one or two special cases the records have been plotted in curve form so that the tendencies are still more quickly perceptible.

The lesson for manufacturing organizations, in this kind of record keeping on railways, is that cost accounting with pooled equipment may be maintained effectively by using enough cross-reference cards or filing sheets to enable the history of any important piece of apparatus to be followed in sufficient detail to give exact data upon its service performance, including its wearing power, reliability and expense of inspection and repair. Thus on traveling cranes, there might well be cards for each of the motors, probably one for the controlling apparatus and one for the mechanical transmission equipment, with a total card summarizing all the essential repairs and changes made from time to time. In the case of a multiple-spindle drill, driven by several motors, the records might provide for the numbering of the motors and their separate tabulation in matters of repair or transfer from machine to machine. If a new design of motor is applied to a machine tool upon which a great deal depends, from the productive standpoint, it may pay to subdivide the individual motors, and record on separate cards the performance of armatures, fields, commutators, leads and brushes. Carried to its logical extension in each case, such a flexible record system affords a comparatively simple and inexpensive means of analyzing the performance of interdependent equipment.

A 12,000-HP. STEAM TURBINE for a Buenos Aires electric works has been built by the firm of Franco Tosi, of Legnano, Italy. The turbine is of the Parsons type, with balancing piston. Governing is done by shifting a balanced throttle-valve operated by an oil-pressure piston, the oil admission and exhaust being directed by a rotary valve actuated by the governor lever. The rotary valve works in a ported sleeve which is rotatable in its casing; the sleeve is connected by lever with the throttle-valve spindle in such a way that as soon as the throttle-valve follows the motion of the governor, the sleeve is rotated in the same direction as the earlier motion of the rotary valve, thus following it and shutting the oil ports.

THE NEW COLOGNE BRIDGES over the Rhine River at Cologne, Germany, consists of two structures. The southerly bridge (the central span of this bridge figured in the recent falsework accident) carries two railway tracks and two cantilevered footwalks. The two arch trusses are spaced 26 ft. apart in the clear. The river authorities required a central clear channel of 150 m., and side channels of 90 m. and 40 m., respectively; the clearance under the floor was to be 30 ft. above high-water level. The accepted design for the bridge shows three steel arch-truss spans over the river portion, and three true arch spans of steel on the right bank. The river spans are through arches, both chords rising above the roadway, with a horizontal tie in the level of the roadway to take the thrust of the arch. The spans are 333 ft., 541 ft. and 333 ft. (101.5 m., 165 m., 101.5 m), respectively, c. to c. The three shore arches are deck structures, with spans of 183.7 ft. in the clear.

The northerly bridge is to accommodate four railway tracks, two trolley tracks, two roadways and two sidewalks, all on one level. This bridge occupies the site of an existing double bridge of smaller capacity, but widening the latter by adding an adjoining bridge proved impracticable for a number of reasons. The old pair of bridges is to be removed entirely, and the new bridge built in its place. But as the old bridge was required to maintain traffic until at least part of the width of the new bridge should be ready for service, the new structure as designed comprises virtually three adjoining but independent structures, seated on new piers wide enough to carry all three. The new piers being so located that they do not interfere with the existing piers, it becomes possible to build the new piers complete and erect on them one of the three new structures, before tearing down one of the existing bridges. The general arrangement of spans and outline of the new bridge is similar to that of the southerly bridge. It comprises three spans, whose c. to c. lengths are 390 ft., 550.2 ft. and 402 ft. (118.88 m., 167.75 m., and 122.56 m.), respectively. The approaches are masonry, with several small arched street crossings. The trusses are arch trusses shaped like those of the south bridge, but the arches of the successive spans are independent and are separated visibly by masonry towers surmounting the piers, whereas the trusses of the south bridge are riveted together end to end, so as to be continuous, and correspondingly lack the stone intermediate towers. The three structures of the north bridge have the following widths: Each of the two double-track railway bridges 26 ft. in the clear between trusses, and the highway bridge 36.5 ft. in the clear, with sidewalks cantilevered out 10 ft. on the free side and 8 ft. on the side toward the railway bridges. The three bridges are distinct in all parts, including the end shoes; only the piers are common to all.

The south bridge requires about 5,500 tons of steel, the north group of bridges about 17,000 tons. The total costs, including foundations and approaches, are about $1,250,000 and $3,250,000, respectively, a total of $4,500,000. The completion of the entire work was scheduled for 1911, but is expected to be delayed a year or more by the accident at the south bridge.

A LARGE REINFORCED-CONCRETE COAL POCKET AT CHARLESTOWN, MASS.

By GEORGE P. CARVER,* Assoc. M. Am. Soc. C. E.

The use of reinforced concrete as a structural material is extending more rapidly each year, and owners contemplating building are getting away from the old lines, and erecting structures which have all the advantages of the old method, few of their disadvantages, and at the same or a slight additional cost obtain a genuine fireproof structure on which it is a waste of money to carry insurance, and on the contents of which the cost of insurance is only a small percentage of the cost for the same material in a structure which can easily be destroyed by fire.

FIG. 1. VIEW DURING CONSTRUCTION OF REINFORCED-CONCRETE COAL POCKET FOR LEHIGH & WILKESBARRE COAL CO., CHARLESTOWN, MASS.
(Designed by Mr. George P. Carver, Assoc. M. Am. Soc. C. E.; Built by The Concrete Steel & Tile Construction Co. of Boston.)

One of the many novel uses to which reinforced concrete has been put is the construction of a large coal pocket, for the storage of anthracite coal, which, so far as the writer has been able to discover, is the largest of its kind. This pocket has been constructed under the design and supervision of the writer for the Lehigh & Wilkes-Barre Coal Co., at Charlestown, Mass., and is capable of holding 10,000 tons of coal. It was determined by the owners to construct of concrete in order that when completed they would have a building that would last for all time; one on which there would be no maintenance charges, and which positively could not burn down.

On the site of this new pocket there was originally a wooden pocket which was in use up to the time the construction of the new pocket was commenced. This old pocket had been erected about twelve years ago, and it was costing $1,000 each year to keep it from falling down.

The new pocket (Fig. 2) is 182 ft. long, 92 ft. wide and 24 ft. deep, and is set up on square columns arranged to allow the construction of paved driveways 13 ft. wide, with a head room of 10 ft. 6 ins. underneath, so that, in loading, a team may be driven through any of the driveways under the pocket containing the grade of coal desired. Upon reaching the proper chute the driver pulls a lever, releasing the coal, which passes over a screen into the wagon, giving a load of clean coal in the shortest possible time. In this way it is possible for a retail company to do the same amount of business with two-thirds of the teaming, compared to the old method of shoveling into the wagons from storage piles.

FOUNDATIONS.—The pocket was located on a filled area between two bulkheads, of a width sufficient to allow a clear space about 40 ft. on one side, but on the other side the wall of the pocket was located on the bulkhead line, which necessitated filling out into the slip a width of 30 ft. for a driveway. With such a great dead weight as the pocket and the coal, it was, of course, impossible to construct the foundations directly on the fill, as the probability was that there would be uneven settlement and possible serious damage to the pocket. It was therefore necessary to build a pile foundation, as the absence of any firm bearing stratum precluded the use of deep footings owing to their prohibitive cost. The matter of piling was seriously considered and it was eventually determined to use concrete piles for this construction, being more desirable in every way than wooden piles and actually costing less money.

In the event of using wood piles the building laws would have required that they be cut off at a grade 10 ft. below the surface of the ground and a load of only ten tons could be carried on each pile. This would have necessitated the use of three times as many wooden piles as concrete and required an enormous amount of excavation, bracing and additional concrete to carry the footings down to grade. Necessity of tide work would have made the use of wooden piles more expensive and awkward, because the excavated trenches would have filled the water at each rise of the tide, requiring pumping, submerging fresh concrete at each tide, and making progress slow and difficult. The construction of a cofferdam around the site was out of the question because of the expense involved. One hundred and forty-three groups, containing a total of 750 Simplex piles, varying in length from 20 ft. to 40 ft., were driven by the use of two 50-ft. drivers, the property of the New England Foundation Co., of Boston, Mass. These piles (Fig. 3) are of a uniform diameter of 16 ins. and are composed of a mixture of 1:2½:5 cement, sand and traprock concrete. In placing these piles, the driver is brought to the proper position over the pile location and a hollow steel form, 16 ins. in diameter, fitted at the bottom with a blunt, detachable cast-iron point is driven until the required penetration is obtained. Sufficient plastic concrete for the length of the pile is then poured into the form, and the form withdrawn, allowing the concrete to settle down into the hole, coming into intimate contact with the surrounding ground, cementing itself thereto and forming a rugged, monolithic column 16 ins. in diameter from top to bottom. The heads of these piles protruded 6 ins. into the reinforced-concrete footings, which were 2 ft. 6 ins. thick, and on which were constructed concrete column bases 4 x 4 ft. x 15 ins.

CONSTRUCTION.—A hoist and tower was erected over the mixer and an incline, equipped with industrial railway and car operated by cable, was constructed from the storage piles of sand and stone to mixer. The concrete was raised to the desired height in the tower and discharged into a chute fitted with a gate. The concrete was drawn from the chute into industrial cars of about 18 cu. ft. capacity each, pushed by hand on tracks to the point of pouring.

The concrete was machine mixed in the proportions of one part cement, two parts clean, coarse sand, and four parts ¼-in. to 1½-in. crushed traprock. All concrete was mixed to a jelly-like consistency and when placed was

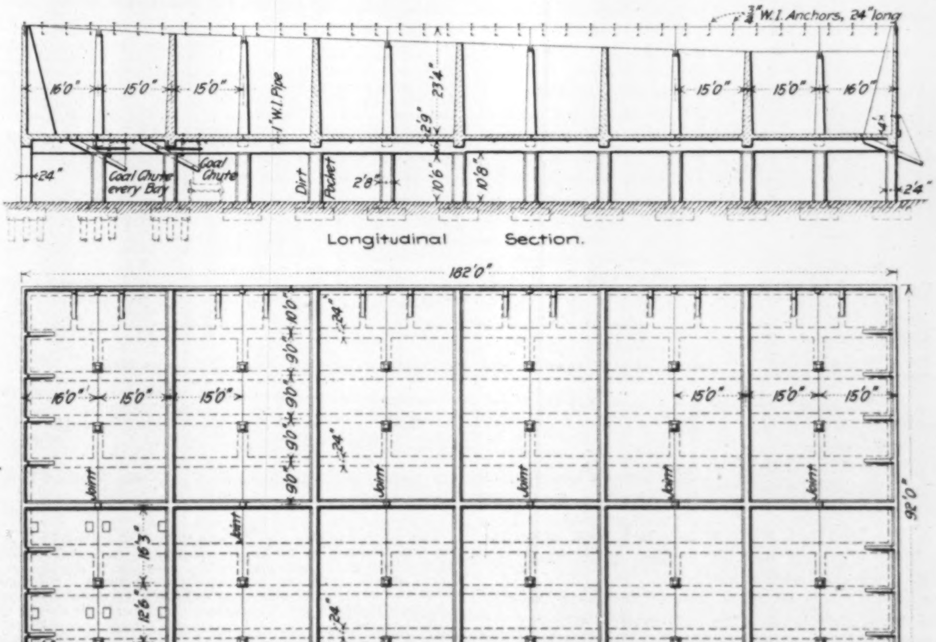


FIG. 2. PLAN AND LONGITUDINAL SECTION OF COAL POCKET.

*Consulting Engineer, 53 State Street, Boston, Mass.

thoroughly worked with spades and other tools to increase the density of the concrete and to work the mortar to the form work so that when the forms were removed the surface of the concrete was smooth and free from voids.

The forms of this work were made of spruce and were built in units at the mill and shipped to the site of the work, where it was only necessary to assemble the various units and support same. This proved to be a very satisfactory and economical method.

The reinforcing steel was delivered on the site of the work and consisted of straight cup bars. Bending of the bars was done by hand, cold, at a very small cost. In placing and assembling, the steel was thoroughly wired together to prevent displacement during the placing of concrete.

On the column bases the column reinforcement was erected and enclosed in a column form, and the forms for the slabs, girders and beams were erected, supported and braced. The columns were then poured with concrete to the underside of the girders and allowed to harden and set for at least 48 hours. During this period the steel reinforcement for the girders and beams was placed, and eventually these members were poured, and also the floor slabs, the reinforcement for which was placed during pouring. The surface of the slab or floor was troweled to a smooth wearing surface while the concrete was soft. Previous to pouring the slabs, boxes at the location of the openings in the floor for the chutes were set and secured, into which openings cast-iron hoppers were finally placed.

Reinforcing rods were left protruding, and to them other rods were spliced as reinforcement for the walls. The forms for the walls were set up in sections to a height of about 6 ft., the reinforcement placed and secured, and forms well braced and the work then poured.

The pocket is divided into twelve separate pockets, one division wall running the entire length through the center of the pocket, and partition walls every 30 ft. apart transversely across the pocket, making pockets 30 ft. by 45 ft. in dimension. These division walls are 2 ft. in width at the bottom and 1 ft. in width at the top, and are designed as cantilevers, the steel being placed vertically and anchored in the girders. Sufficient horizontal steel was used so that cracks would not develop. The outer walls are 12 ins. thick at the bottom and 8 ins. thick at the top and are 24 ft. high. They are stiffened with buttresses every 10 ft. (Fig. 4). These buttresses extend into the pocket 7 ft. at the floor level and run to within 8 ins. of the line of the wall. They are 10 ins. wide and reinforced with nine steel rods on the inner face, running down into a beam for anchorage. The walls between the buttresses were designed as beams and the steel was bent in at the buttresses and held by rods anchored into the buttresses.

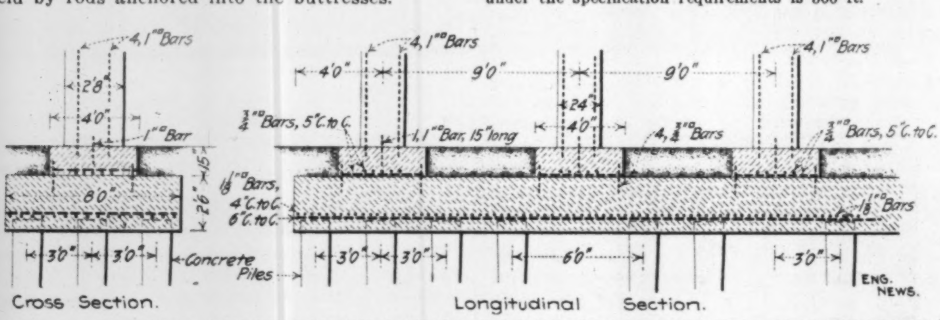


FIG. 3. SECTIONS THROUGH FOUNDATIONS OF REINFORCED-CONCRETE COAL POCKET AT CHARLESTOWN, MASS.

A wooden roof with a tar and slag covering encloses the top of the pocket, protecting the coal from rain and snow.

A new trestle 50 ft. in height has been erected and from this leads four automatic railways, no other power than gravity and a weighted triangle being necessary for their operation.

On the interior of each pocket under the tracks has been erected a series of deflectors on an 8-in. pitch, each deflector being constructed of wood and protected against excessive wear by sheet iron. The coal slides from one deflector to the next lower, and in this way prevents a straight drop of the coal to the concrete floor below, thereby reducing the breakage to a minimum.

Transversely across the building on each side of the lower columns a reinforced-concrete wall 4 ins. thick has been constructed, forming dirt pockets. These pockets receive the screenings from the coal as it runs over the screen in the chutes. These screenings are shoveled out through openings in the bottom of the dirt pockets into carts taken to a screening plant, where they are deposited into a large hopper and discharged on to a vertical bucket conveyor carried up and run through a revolving screen and separated into the smaller sizes of coal. This plant is electrically operated.

Under the pocket in all driveways, granite block paving with grouted joints is laid on a gravel base. This paving runs also 30 ft. out from either side of the pocket, around and under the screen house, and up to the scales and office.

Under the pocket in each bay is a 16-c. p. electric light and under the roof over each separate pocket is a light and a reflector. The outside of the pocket and the yard is equipped with six arc lights.

The Concrete Steel & Tile Construction Co., of Boston, were the general contractors.

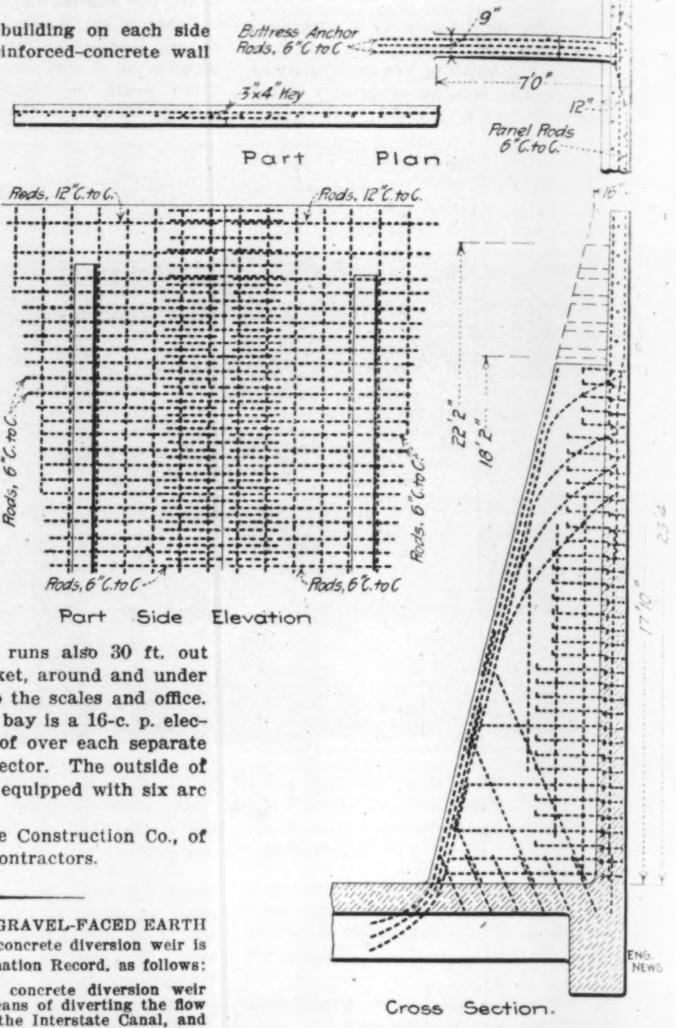


FIG. 4. TYPICAL DETAIL OF SIDE BUTTRESS, CHARLESTOWN COAL POCKET.

THE COST OF BUILDING A GRAVEL-FACED EARTH dike at the site of the Whalen concrete diversion weir is reported on in the U. S. Reclamation Record, as follows:

This dike, together with the concrete diversion weir abutting onto it, furnishes a means of diverting the flow of the North Platte River into the Interstate Canal, and will serve that purpose for the Fort Laramie Canal when it is constructed. The dike is about 1,600 ft. in length, 11 ft. wide on top, with an average height of 10 ft. and side slopes of 2½ to 1.

The embankment is now practically completed and contains about 35,000 cu. yds. of earth. The earth for its construction has been taken from a borrow pit on the upstream side thereof, the nearer edge of the borrow pit being not less than 100 ft., and the outside edge at about 500 ft. The whole embankment is faced with a covering of gravel, the thickness on the top and downstream slope being 1 ft., and that on the upstream slope 2 ft. Practically the entire embankment has been covered with gravel at the present time, involving the placing of about 6,040 cu. yds. of gravel. The distance from the gravel pit to the south end of the dike is 1,700 ft. on a down grade of approximately 1% from the pit and the total average haul is about 2,620 ft. The free haul under the specification requirements is 500 ft.

The earth body of the embankment was placed in layers varying from 6 to 12 ins. in thickness, and these layers spread by hand and thoroughly compacted by the passage of the scrapers and teams over them. The material as excavated shrank about 20% through the compacting to which it was subjected in being placed in the embankment.

The gravel facing was loaded with wheel scrapers through a trap into four-horse wagons with slat bottoms, each holding about 2½ cu. yds. The gravel was dumped from the wagons onto the embankment and spread on the slopes thereof by means of a Fresno scraper and a hand shovel. Foremen were paid from 35 to 40 cts. an hour; laborers from 22½ to 25 cts. an hour. The labor of horses in the earth work has been rated at 10 cts. an hour, and in the gravel work two-horse teams with drivers, at from 40 to 45 cts. an hour; three-horse teams with drivers, at from 50 to 55 cts. an hour, and four-horse teams with drivers at from 60 to 65 cts. an hour.

Below is given a table of the unit costs per cubic yard of the earth body of the dike and of the gravel facing thereof distributed to labor, superintendence and plant depreciation. The cost data in the table following includes 30,000 cu. yds. of overhaul amounting to $450, which has not been separately considered.

Distribution.	35,000 cu. yds. earth body. Total cost.	Unit.	6,040 cu. yds. gravel facing. Total.	Unit.	Total.
Labor	$7,695	$0.219	$5,281	$0.874	$12,976
Plant depreciation	400	.011	135	.022	535
Superintendence .	150	.004	120	.020	270
Total	$8,245	$0.234	$5,536	$0.916	$13,781

THE IRON ORE PRODUCTION of the United States in 1907, according to a bulletin of the U. S. Geological Survey, amounted to 51,720,619 long tons, an increase of 8.32% over 1906, the most productive previous year. The maximum production of any one mine was 2,900,624 tons, from the Hull-Rust mine in Minnesota. The Lake Superior district, which includes Michigan, Minnesota and Wisconsin, produced 80.51% of the total. Details of the foreign trade in ore and of the pig iron production are given in the bulletin, as follows:

During 1907 the United States imported more than 1,200,000 long tons of iron ore. Of this total over half was from Cuba and about a third from Spain. About 116,000 tons came from British North America, and the remainder was from numerous smaller sources of supply. The exports during the year amounted to 278,208 long tons, a slight increase over the exports of 1906. The bulk of these exports represent Lake Superior ores shipped directly from the American side to Canadian furnaces.

The production of pig iron in the United States in 1907 amounted to 25,781,361 long tons, as compared with an output of 25,307,191 tons in 1906 and of 22,992,380 tons in 1905. The small increase shown by 1907 over 1906 is due to the falling off in demand and production during the last quarter of the year.

The 1907 production of Bessemer steel ingots and castings shows a decrease from that of 1906 of 608,281 tons, while the production of open-hearth ingots and direct castings shows an increase of 568,675 long tons.

A NEW TYPE OF SWITCHBOARD: FOR THE SALT RIVER PROJECT, U. S. RECLAMATION SERVICE.*

The engineering features of the various works in connection with the great Salt River Project of the U. S. Reclamation Service, near Phoenix, Ariz., have been treated from time to time so that it is of interest to place on record something about the switchboard developed for the control of the 6,000-KW. hydro-electric station which supplies a 45,000-volt transmission system.

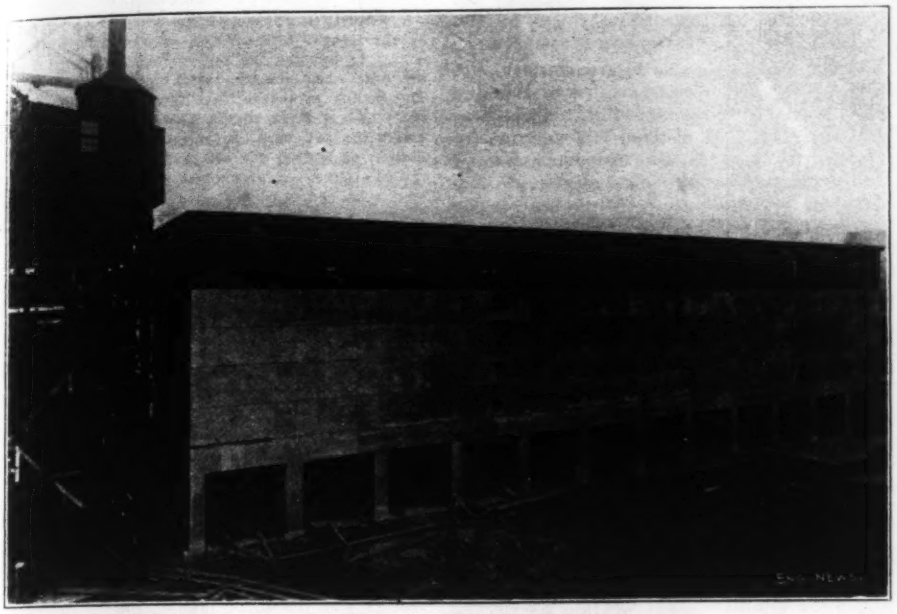


FIG. 5. SIDE VIEW OF FINISHED COAL POCKET.

The alternating current switchboard selected by the government engineers for controlling the apparatus in the main station, is a development of recent "bench," control-board construction. It is of the "open" type, that is, there is a space left between the instrument sections and the control bench, so that the switchboard operator can have an unobstructed view of any part of the generator room without going to the end of the board, which is located at the edge of the gallery about 18 ft. above the main floor. This benchboard is equipped for the control of the following circuits, the exciter switchboard being entirely independent and of the ordinary vertical construction:

Six 2,300-volt, 1,060-K.V.A., 25-cycle, 3-phase, 3-wire generators; six 2,300-volt, delta 45,000-volt Y, 1,060-K.V.A., 25-cycle, 3-phase banks of transformers, grounded neutral; two 45,000-volt, 6,000-KW, 3-phase, outgoing lines.

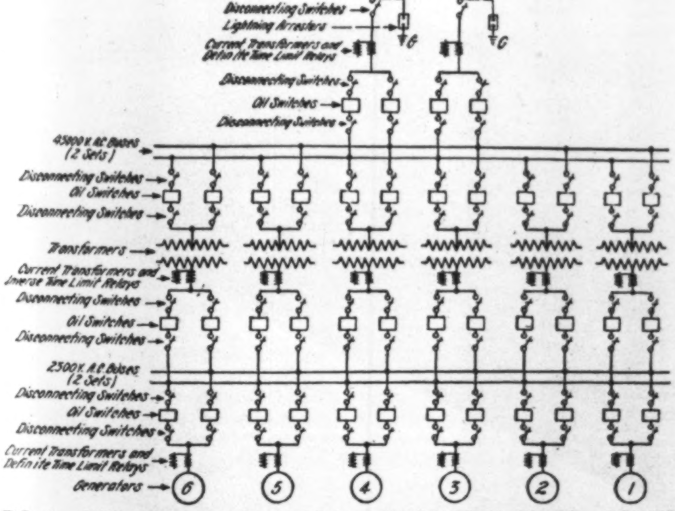


FIG. 1. SIMPLIFIED DIAGRAM OF BENCH CONTROL BOARD. POWER STATION OF THE SALT RIVER PROJECT.

Fig. 1 shows the system of connections specified by the government, one line in this diagram representing the three phases. It will be seen that both high and low tension busses are in duplicate, allowing ample flexibility for operation, testing, inspection and repairs. Two electrically operated oil switches are used in every circuit and complete control of the system is therefore obtained at the benchboard. This arrangement is advantageous where it is important that there be no shut downs of an appreciable length of time. With more than two transmission lines it would probably have been advisable to modify the connections to allow of isolating any line for testing purposes after the automatic switch had been tripped by a short circuit or other line trouble.

All protective relays used on this board are of the time-limit type. Inverse time-limit overload relays are used on the transformer circuits and are so connected that trouble in any transformer will automatically disconnect all the transformers but will leave the generators operating in parallel on the low-tension bus. That the government engineers anticipate but little trouble with the transformers is evidenced by the fact that no provision is made in the transformer protective devices for selective operation. By using series, inverse, time-limit, overload relays on the high-tension side of the transformers, in addition to the low-tension relays, only the defective bank of transformers would be disconnected in case of trouble.

The low-tension oil switches are a standard type, as shown in Fig. 3, each complete switch consisting of three of these single-pole, single-throw elements operated by a single solenoid. The switches are mounted in fireproof cells, each pole in a separate compartment, with the solenoids in small subcells. The cell doors are made of asbestos lumber with a fireproof, wooden framing and are pivoted at the top, but have no fastening at the bottom. This light, free swinging construction of cell doors has proven preferable to heavy doors which are fastened tightly to the cells as the effect of explosions in the cells is temporary only, so far as the door is concerned.

The disconnecting switches, bus bars and instrument transformers are mounted on pipe framework above the oil switch cells. As will be seen from the diagram of connections, disconnecting switches are provided on both sides of every oil switch, so that any switch can be inspected, tested and repaired without shutting down any of the circuits.

The high-tension oil switches are similar in construction to the low-tension switches. This switch is a top-connected device, but in this case the busses and disconnecting switches are necessarily located below the oil switch cells. Masonry compartments are provided for the high-tension bus bars.

Protection against lightning is obtained by the use of a three-phase, aluminum-cell, lightning arrester for each transmission line, these arresters being mounted outside of the station.

The benchboard proper consists of six panels of oiled black slate, the total height, including the instrument section, being 8 ft. 2 ins., and the length, exclusive of the swinging bracket, 12 ft. 7 ins. Facing the switchboard, Fig. 2, the first panel at the left controls the two outgoing lines, the next two panels each control three banks of step-up transformers and the three panels at the right-hand end control two generators each. The alternating current voltmeters and the synchronism indicator are mounted on a swinging bracket at the right-hand end of the board. The back of the instrument sections and control bench is entirely enclosed by removable grille-work doors.

One alternating current ammeter, one field ammeter and one polyphase indicating wattmeter are provided for each generator circuit. The two voltmeters on the swinging bracket are connected to the synchronizing bus in such a way that, when synchronizing, one indicates the voltage of the starting machine and the other the voltage of the bus bars to which the incoming machine is to be connected. At other times the synchronism indicator is disconnected from the synchronizing bus by means of a small snap switch mounted on the swinging bracket and the voltmeters can then be connected to any machine by means of the synchronizing plugs entirely independent of the synchronism indicator.

The synchronizing and control switches and the relays are mounted on the control bench. Two synchronizing receptacles are provided for each generator, one being used when synchronizing with bus No. 1 and the other when synchronizing with bus No. 2. Two sets of contacts in these switches are used for synchronizing purposes, but the third set of contacts is connected in series with the closing side of the corresponding oil switch control switch so that no damage can be caused by the operator becoming excited when synchronizing and trying to close the wrong oil switch. To assist the operator in synchronizing, a governor control switch is provided for each generator circuit, this being a double-pole, double-throw, reversing switch connected to the governor motor.

The controlling switches for the oil switches and field switches are twin pull-button type, as shown in Fig. 2, which also shows the indicating lamps or bull's-eyes. An indicator is provided on each switch, which shows green after

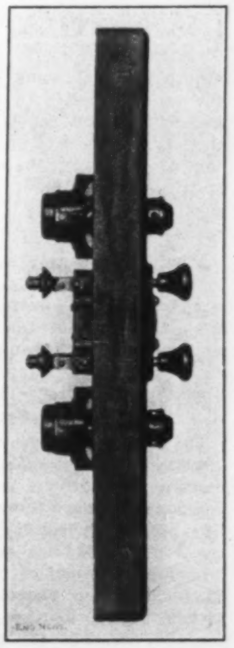


Fig. 2. Twin Pull-Button Controlling-Circuit Switch with Indicating Lamps.

*Arranged from information supplied by the General Electric Co., Schenectady, N. Y.

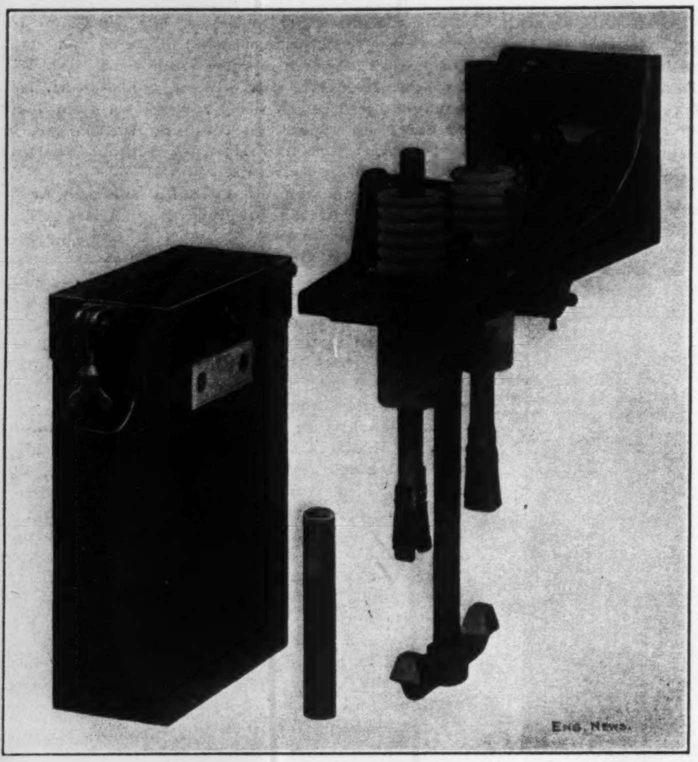


FIG. 3. OIL SWITCH FOR USE ON 15,000 VOLT LINE; 300-AMPERE CAPACITY.
(Made by General Electric Co.)

the control switch has been operated to open the oil switch and red after it has been operated to close it. The indicating lamps are connected so that they show the actual position of the main switch, red when the oil switch is closed and green when it is open. If the indicating lamps and the switch indicator do not agree the operator knows that the oil switch has tripped automatically. When this has occurred the control switch indicator shows red and the indicating lamps green. To make the indicating lamps plainly visible from a considerable distance or at an angle, a V-shaped projection is cast on the front of the lens.

Generator-field rheostats are mounted below the switchboard gallery and are controlled by combination, bevel-gear and chain mechanisms, the operating hand wheels being mounted on pedestals in front of the switchboard. The field switches are solenoid operated and controlled from the benchboard, the same type of control switch and indicating lamps being used as for the oil switches. As stated above, the exciter and field switch panels are of the ordinary vertical type, two sets of bus bars being used. As the field switches are single-pole, single-throw it is necessary to connect double-pole, double-throw lever switches in series with them so that the fields can be connected to either bus.

Mimic bus bars are mounted on the control switch bench consisting of small, polished, copper bars which have no electrical connection with any part of the circuit. They show the system of A. C. connections exactly as indicated in Fig. 1. The controlling switches represent the oil switches and nameplates represent the generators, transformers and lines.

The overload relays provided for the generator circuits are single-pole, the secondaries of the current transformers being cross connected. As the generators are three-wire machines, the third line necessarily carries the resultant current of the other two lines and full protection is obtained by the use of two current transformers. This connection cannot be used on the transformer panels, as three ammeters are provided for the transformer circuits, and it was consequently necessary to use double-pole relays. On the middle generator panel is mounted the signal relay which is used to ring an alarm bell when any of the oil switches are tripped automatically. This relay is arranged so that the bell continues ringing until the operator releases and is connected in such a way that it does not operate when the oil switches are opened or closed by the switchboard operator.

Each transformer circuit and each line is equipped with three ammeters. In addition to these instruments there is one ammeter connected in the neutral bus so as to read ground currents. The controlling-circuit equipments are similar to those for the generator panels. Synchronizing receptacles are provided for the line circuits but not for the transformer circuits, the receptacles for the line circuits being intended for use when additional generator station are laced in operation.

To conclude, some observations on the general arrangement and equipment of this board are worthy of attention. No panel is crowded, and the control and measuring apparatus is simple. The equipment for each circuit is segregated so that there is no confusion in emergencies. There are no elaborate testing equipments included. This board seems to be designed wholly for constant use in controlling the machines and circuits.

The board and equipment was designed and built by the General Electric Co., of Schenectady, N. Y., to meet the requirements of the government specifications.

A FOLDING STADIA ROD WITH TARGETS made by the Keuffel & Esser Co., of New York City, is intended to combine the self-reading and target features, the targets being mainly useful for unusually long sights. The folding arrangement (a 5-meter rod folds in three parts and is fitted with a leather handle for carrying) makes the rod more convenient in rough country. The hinges, of bronze, are set in flush with the wood, and the side plates are grooved to pass the targets. Catches and locks connected with the hinges hold the parts in position when the rod is opened out. The rod has centimeter divisions and the target vernier reads to millimeters. Similar to other target rods, this rod is relatively narrow as compared with ordinary stadia rods, which restricts the possibilities of the marking.

THE PAIL SYSTEM of night soil collection and disposal in use at Ploen, Holstein, is the subject of a note kindly sent to this journal by Prof. W. P. Mason, of Troy, N. Y., who is now in the European city named. Prof. Mason writes:

The city is an old one, numbering some 3,800 inhabitants, and possesses neither water nor sewerage system. Galvanized iron pails, fitted with tight covers, are used for the collection and removal of dejecta, the clean ones being brought into the houses covered, and the covers then clamped upon those ready for removal.

Upon reaching the disposal station, outside the city, the collected material is mixed by hand with dried peat and the mixture sold for fertilizer. Before returning the pails to the city they are scoured by hand-driven brushes and thoroughly washed.

The contractor and his son supply the only labor required and the city pays them 1,600 marks ($400) yearly for the entire service. The contractor also retains the sum arising from the sale of the manure.

As illustrating the cost of the system for separate houses, let it be added that the small "Hotel zum Prinzen," having five "seats," pays a yearly city tax of 68 marks ($17) for the service.

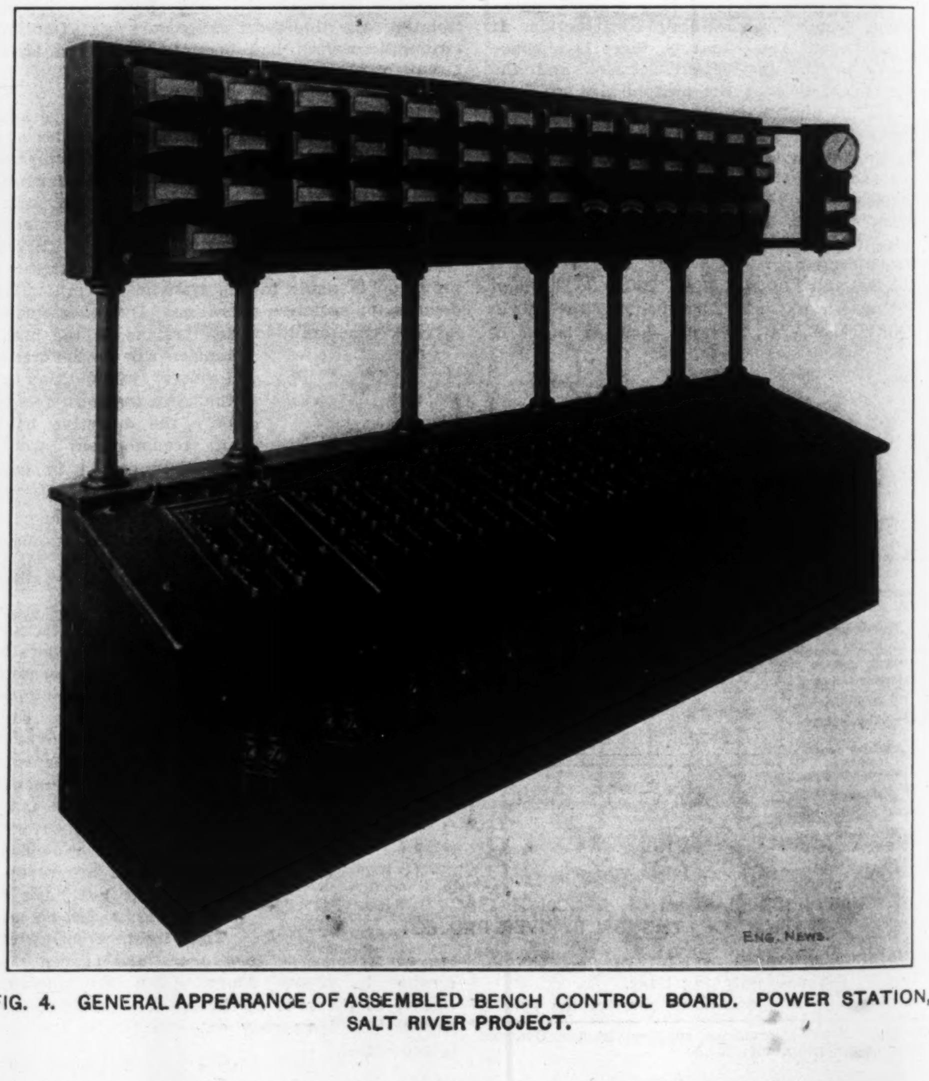


FIG. 4. GENERAL APPEARANCE OF ASSEMBLED BENCH CONTROL BOARD. POWER STATION, SALT RIVER PROJECT.

ENGINEERING NEWS

A Journal of Civil, Mechanical, Mining and Electrical Engineering

Published every Thursday by

THE ENGINEERING NEWS PUBLISHING CO.
220 BROADWAY, NEW YORK

BRANCH OFFICES
CHICAGO: 1636 Monadnock Block
WASHINGTON, D. C.: Home Life Building
ATLANTA: Candler Building
...LPH MOSSE, BERLIN AND HAMBURG, GERMANY
Z. P. MARUYA & CO., Ltd., TOKYO, JAPAN

G... H. FROST, President
CH... WHITING BAKER, Vice-President
HA...OD FROST, Secretary
FR... W. FROST, Treasurer

A... E. KORNFELD, Manager
ED... HUNT FROST, Ass't Manager

CHARLES WHITING BAKER, M. N. BAKER, E. E. R. TRATMAN, F. E. SCHMITT, } Editors

SUBSCRIPTIONS

United States and Possessions, Mexico and Cuba, One Year, $5.00.
Canada, $7.00 a Year.
Foreign Countries, Regular (Thick Paper) Edition, One Year, $9.00. (£1-18-0.), 45 Francs or 37 Marks.
Foreign Countries, Thin Paper Edition (Construction News Supplement Omitted), $7.00. 29 Shillings, 35 Francs or 29 Marks. Remit directly to our office.
Pay no money to canvassers for subscriptions.
Remit by Post-Office or Express Money Order, Draft on New York or London, or by Registered Letter.
Notice of change of address should reach us one week in advance of removal. The old as well as the new address should be sent.
Subscriptions cannot be dated to commence with past issues. All subscriptions commence with current issue and back numbers can be supplied only by special order.
Receipts for Subscriptions will not be sent unless requested, the changing of the expiration number being considered sufficient. The number on the address label indicates when subscription expires, the last figure indicating the year and the one or two preceding figures the week of that year. 52-7 means the 52d week or December 26, 1907.

ADVERTISING

"Contract": Rates furnished on application.
"For Sale": $1.50 per inch.
"Proposal": $2.40 per inch.
"Want": See "Want" Pages.

Copy for regular, or "Contract," Advertisements should be received at least ten days before publication; "For Sale" and "Situations Wanted" Advertisements by Monday, and "Proposal" and "Situations Open" Advertisements by 9 A. M. Wednesday.

Entered at the New York Post-Office as Second-Class Matter.

The fallacy of seeking greater capacity of a city railway by employing higher speed of cars is so common that we are not much surprised to find the Philadelphia "Record" making an argument based on this erroneous idea. In a recent issue that journal urges the adoption of higher speeds on the Philadelphia trolley system, in order that it may be enabled to carry more passengers. Philadelphia the Slow seems to be too fast for its trolleys. The "Record" asserts that in Boston the surface cars run much faster, and then says:

> A high speed here would enable the Rapid Transit to carry more people and earn more money on the same amount of trackage.

This clearly implies the claim that increased capacity would result from increased speed.

The average man, in thinking of a transportation system, almost invariably takes a mental trip on the line and shifts his viewpoint with the car as it goes along. When the car moves swiftly, he instinctively feels that the work of transportation is going along briskly; he reasons that, as the car leaves behind it a greater length of track in a given time than if it were running more slowly, the system must for that very reason be in the better condition as to capacity. There is in the background of his consciousness the specious analogy of the pipe through which water flows: The more rapid the velocity of flow, the greater the volume of water discharged in a given time; and by analogy, the faster we run our cars, the more cars can be run. He does not reflect on the misleading character of such a comparison between continuous flow and intermittent progression. He does not realize that to get correct views on his car problem he should stand at the street-corner, where the crowds wait for the cars, and observe the procession of arriving, stopping and departing cars. For if he did he could not fail to see that capacity is entirely unrelated to the speed at which the cars run after they leave the corner. He would observe also that the denser the procession of cars, i. e., the greater the capacity developed, the slower are the cars running; and he would conclude that so far as speed and capacity have any relation at all it is an inverse one, the higher speed being coincident with lower capacity and lower speed with greater possible capacity.

The curious feature about the "Record's" argument is the implication that the Philadelphia cars are mechanically limited to low speeds. It happens that, as street cars are built, any of them is amply able to run at speeds as high as 20 to 25 miles an hour, and so far as construction or motive-power is concerned the Philadelphia cars are able to run considerably faster than even the "Record" would approve. If, as the editorial from which we quoted seems to assume, the car speeds in Philadelphia are unduly low, the cause is clearly to be sought in the congested traffic conditions. We believe the "Record" would find it an illuminating study to investigate these conditions and their effect on carrying capacity before repeating its unwise and futile demand for higher speeds.

Water distribution systems for railway service are rare and where in use have been installed to meet special conditions. Elsewhere in this issue we describe one in New Mexico, the pipe mileage of which exceeds the length of the railway division which it supplies. In addition to its 160 miles or so of wood pipe this water supply system includes a storage reservoir of well-nigh a half billion gallons capacity and pumping stations to overcome an elevation of 925 ft. The new supply displaces one from deep wells, the water of which gave serious trouble because of the large amounts of incrusting constituents which it carried, and that notwithstanding the use of an expensive water-softening plant. The new supply, it is stated, will pay for itself in 18 months through the savings it will effect.

Although the railway water supply problem is doubtless at its worst in the alkaline regions of the Southwest and West, at least one railway of the East has found it expedient to replace isolated supplies for individual tanks on miles of road. The most notable instance of this in the East, so far as we remember, is afforded by the various systems built or under construction for the Pennsylvania Railroad, between Philadelphia and Pittsburg. One of these, comprising 135 miles of 36 to 10-in. cast-iron pipe, as well as other notable features, was described in our issue of April 9, 1908. Here the problem was to secure an abundance of water during the summer droughts and to avoid of corrosive qualities of the old supplies, due to the acid mine wastes which render some of the streams of Pennsylvania unfit for industrial as well as domestic use.

A much earlier consolidated or centralized railway water supply system, perhaps one of the very earliest in the East, was a relatively small plant built by the Long Island R. R. a dozen years ago (Eng. News, Feb. 20, 1896). That was before the days when water-softening plants were common in this country, and it was to avoid a scale-producing water, as well as charges at city rates, that the Long Island plant was built.*

Although but few centralized railway water supply systems have yet been built, it is reasonable to expect that other railways confronted with similar problems will follow the lead of those mentioned in this note. Certainly there are many railways that would be glad to free themselves from hard or muddy or acid waters, and that find small scattered plants for treating the water a source of heavy expense and annoyance, if not of serious difficulty. Centralized plants for softening or otherwise treating water may seldom if ever prove feasible, except at junctions and joint terminals. But centralized plants which substitute a naturally pure for an (industrially) impure water are quite another thing, particularly where they save pumping as well as purification.

*We are informed by Mr. G. C. Bishop, Supt. Motive Power, L. I. R. R., that the pipe lines have been extended and that the average use of water is now 211,500 cu. ft. per day; but this includes some water supplied for other than railway purposes.

The use of bran to stop leaks in a long wood pipe line, which forms a part of the first of the railway water supply systems mentioned in the foregoing note, may possess no novelty whatever, but we do not remember of having seen so explicit an account of its successful use, particularly on so long a conduit.

Perhaps more interesting and novel than the use of bran for stopping leaks was its use to determine the velocity of flow in the conduit. Green and red coloring matters were also used to ascertain the velocity. The bran (30 lbs.) and the green aniline dye (1 pt.) were readily discernible, after traversing 13,200 ft. of 10-in. and 47,500 ft. of 16-in. pipe, or nearly 15 miles, but the ½ pt. of permanganate of potash used as a red color could scarcely be detected when it made its appearance at the lower end of the conduit. These velocity tests and their results are described and discussed at some length in the article named and are worthy of attention on the part of those interested in such subjects.

Ten years ago, when the State of New York undertook the work of building a waterway from Lake Erie to the Hudson River, it was argued that the State must do this work itself and could not safely entrust it to the Federal Government, because other cities which are rivals of New York in the export trade would combine and use their influence in Congress to prevent the work from being undertaken or long delay its completion. The commercial supremacy of New York City, it was said, depends on a waterway from the Lakes to the Atlantic and so New York cannot trust any one else to build or control this waterway.

This was the argument of which much was heard ten to twenty years ago; but it sounds absurd at the present day. New York City has continued to increase by leaps and bounds in wealth and population, and though abundant grass grows in the Erie Canal it does not grow in New York streets. Events have proven, without the shadow of a doubt, that New York's prosperity does not hang on waterway communication with the West. Had New York's commerce been in the critical condition that was claimed when the voters of New York were persuaded to vote $101,000,000 for building the thousand-ton barge canal, her decline would already be far advanced.

It is interesting to recall now these arguments of a dozen years ago, for in the light of present knowledge it would appear that New York would have secured a waterway connection to the Lakes much sooner had it successfully used its great influence to have the Federal Government do the work than it will by performing the work itself. The work on the thousand-ton barge canal proceeds, it will be generally agreed, with provoking slowness. It is over four years since the legislation was complete and the organization made effective for construction; yet only a quarter of the work is as yet under contract and only 4% of the total has been completed. During May of this year, the total work done amounted to $366,890. At this rate it will take twelve months to spend 4½ million dollars and over 20 years to complete the whole work, assuming the cost at $101,000,000. Of course the monthly output will be far greater when all the contracts are let, but on the other hand stress of weather suspends most of the work during the winter.

We are referring to this slow rate of progress now to record the fact, not with any idea of criticism. As to the reasons for the slow progress, some of them are set forth in the annual report of the Advisory Board of Engineers, recently issued.

Great difficulty is being experienced in inducing contractors to bid upon this work. Among other reasons which make contractors wary of submitting bids, is the complications

which might follow changes in the State Government. The Advisory Board might bring some small influence to bear to protect an honest contractor; but that it could really compel a square deal with a corrupt state administration in control of the canal work is not at all likely. The Advisory Board itself, in its last annual report, enumerates "possible change of control during the life of the contract" as one of the reasons why contractors are slow to put in bids.

The reasons which the Advisory Board gives for the long delay in getting the work under way are the length of the whole canal system, aggregating 445 miles, lack of appreciation of the climatic and physical difficulties, and the need of adjusting the many conflicting claims and vested rights of corporations, individuals and others and of choosing the alternative routes through various cities along the line.

Unquestionably all these difficulties exist and it has required and will require much time to meet them successfully. In the winter, the contractor is greatly hampered by the severe climate and much work has to be suspended. In the summer, work must be carried on without stopping navigation on the adjacent canal, and this interferes with progress at many points. Further, contractors have to keep their bids within the engineer's estimate of the cost of the work, and it is claimed that in the preparation of this estimate not enough was allowed for the contractor's investment in working plant and its depreciation, for his expenses for bonds, employees' insurance, fire insurance and general administration. These are among the reasons why calls for bids on Erie Canal work have met with few responses, even at a time when contractors are hunting jobs and willing to work on small margins of profit.

We point out these matters to present facts, not in any spirit of criticism. In the light of these facts, one would be rash to set a date when the barge canal system will be completed and available to save New York from the commercial paralysis that was supposed to threaten it twenty years ago. It does look, however, as if a Canadian deep waterway to the sea—an actual deep waterway, large enough to allow large Lake and ocean steamers to pass through it without breaking bulk—would be completed and would outclass New York's barge canal long before the latter has had a chance to justify its construction.

A CURIOUS PHASE OF THE STREET RAILWAY BANKRUPTCY IN NEW YORK CITY.

For nearly a year past the large and busy street-railway system of the old city of New York, the present boroughs of Manhattan and Bronx, has been enmeshed in a receivership of progressively growing complexity. The remarkable system of consolidated companies, whose nature we have already characterized* and whose make-up has been analyzed in detail by the Public Service Commission,† could not be made to pay when operated under experienced management, and is now being administered by a group of half a dozen lawyers who are endeavoring to secure more satisfactory results. As it would be too much to expect that these men, untrained in street-railway matters, could operate the lines at higher efficiency than their predecessors, it is inevitable that to make a better financial showing they must employ means not available to a management lacking the protection and direction of a court-of-law.

The disaggregation of the great consolidation, or rather the process of lopping off the most burdensome components, seems to be the chief instrument of this undertaking. In the course of this work, a very disagreeable transfer muddle has recently been created, which furnishes much food for reflection. It evidences the arbitrary manner in which public-service matters are usually managed, and, we believe, emphasizes the imperative need for such organs of control as New York State has established in its two Public Service Commissions.

A street-railway line known popularly as the Belt Line, which has long formed part of the united system under a lease, has been separated from the system by abrogation of the lease; thereby the general State law requiring issue of transfers between intersecting lines of a single company became inapplicable and transferring was discontinued. It happens that very many passengers had come to rely on these transfers for their daily transportation, and they now are compelled to walk or pay double fare. This situation is not at all novel, but some of its attendant circumstances are both new and interesting.

The Belt Line, more properly the Central Park, North & East River R. R. Co., was leased by the Metropolitan in the course of the latter's progressive acquisition of control over all the surface car lines of Manhattan Borough. The lease rental agreed to was high, exorbitant in fact. There is no claim that the lease was made in order to give the traveling public the benefit of transfers, to improve the service generally and thus stimulate traffic. Apparently the transaction had the object merely of centralizing control for purely speculative purposes; at least the ordinary motive of monopoly, eliminating competition, could have little influence, as the lines of the companies were in no direct competition. Whether the leasing was a wise move or not, we are justified in assuming that the supervisory authority of the State, had it been exercised at the time by some capable body like the present Public Service Commission, would have scrutinized the conditions, brought out its necessity or advisability or the reverse, and passed upon the terms, such as rental. The least that such a commission would have accomplished is a fair determination of whether the rental was proper, i. e., adequate as concerns the lessor and not unduly risky for the lessee. As the thing was done, without such supervision, no one during many years ever discovered, ostensibly, until the present embarrassment of the consolidated concern, that the lease was unprofitable. Now the public must pay in the coin of inconvenience for the ill-considered action of its "uncrowned kings," as the street-railway magnates have termed each other.

But, it may be asked, is the public any worse off now than it would have been if the lease had not been made, and therefore the transferring had never been begun? It is very much worse off. The long-continued existence of transferring at a given point creates and directs currents of traffic in a certain path, influencing the distribution of business and residential territory, etc. To discontinue suddenly a transit facility which has created and continued extensive movements of population is clearly a hardship which would not have been incurred if these movements had never been created; in other words, if the transferring had never been started.

The point of the matter is this: Changes in the operation of traffic on a street-railway network have too important a relation to the orderly life of the community to be undertaken suddenly or arbitrarily. A capable and powerful supervisory authority is necessary to control such changes. In particular, changes in transfer privileges, including the initiation as well as the discontinuance of transfers at a given point, are a delicate matter, and if ill-considered they are sure to be harmful.

It is worth noting that the New York situation was in part brought about by the State law requiring the issuance of transfers at intersections of different lines of a single company. Such a law seems to imply the assertion that it is desirable to issue transfers at all intersections. We believe that this is an error, and that not every intersection in a large network necessarily has a sufficient claim for the transfer privilege. Without stopping to enter into a proof of this view, we need say only that it is generally conceded that the transfer privilege in New York City is grossly abused, that the public itself suffers thereby, and that, in our opinion, such abuse is facilitated in compound ratio with the number of transfer points in a given area. The need for a general law, of course, arises from the fact that the company itself cannot be relied upon to issue transfers at a sufficient number of points, or to issue them at all without compulsion. But with a capable supervisory authority to protect the interests of the public, the need for a universal transfer law no longer exists. Better results for all concerned would be obtained by putting the whole matter of transfers into the hands of the Public Service Commission, with ample power to enforce its mandates.

Another interesting matter about this case is the way the abolition of transfers by abrogating the Belt Line lease was brought about. The Metropolitan company, as already stated, never discovered the unprofitableness of the lease which is now alleged, or if so it did not take the public into its confidence. A short while ago, however, the company, with the aid of several accommodating creditors, went into a "friendly" receivership. Although the business is entirely within the State, a Federal court was sought out for the receivership, whereby incidentally the State is greatly hampered in enforcing its jurisdiction over the company and protecting the interests of the public. Under these auspices the process of purifying the system is going on, including, apparently, the repudiation of lease contracts and other obligations which are no longer advantageous. The component companies are fairly well crippled and cannot easily become a menace to the supremacy of the consolidation. For example, when the largest original independent, the Third Avenue Railroad Co., was cut off, by the simple expedient of defaulting on the interest, the separate receiver appointed for the Third Avenue reported that he found the property in "a deplorable state of equipment." The purifying process was applied to the Belt Line by a method which we, in our ignorance of law, had always believed impossible, namely, the simple cancellation of a contract by the act of one of the parties alone. It is true, of course, that this party acted with the authorization of a Federal judge.

A striking feature of the difficulty is that now the lawyer-managers of the Metropolitan object to an order of the Public Service Commission to issue transfers between their line and the Belt Line. The owners of the latter, who have resumed possession of their property, are willing to issue transfers, on a half-and-half basis, but the larger company refuses. In effect, ever since the institution of the receivers, they have denied the authority of the Commission to exercise control over the operation, so that the legislation of the State in this respect is very successfully annulled.

Out of the tangle of these maneuvers it appears that when a public-service corporation gets into such difficulties that it must be put under guardianship, the first responsibility of the guardians should be toward the service rather than toward the stock and bond interests. The public should be regarded as a preferred creditor, and such a view should be given explicit recognition by statute, if it is not to be obtained in opinions of courts. Certain it is that the opposite view—the view that the public is only an asset on the receiver's list and not an obligation—has proved capable only of perplexing the situation, without clear advantage to the property as such, i. e., to the security holders.

In conclusion, we are tempted to submit this question: Where the State has instituted a capable and highly-organized Public Service Commission, is not that organization the natural instrument for the temporary administration of a crippled public-service enterprise, so far as the conduct of transportation is concerned? Independent court receivers, whether "friendly" or not, may be excellent means for handling the mere business items, when coupled to the Public Service Commission as operating directorate; but to turn over to them the entire operation is bound to produce a confused, unsatisfactory state of affairs under which, as in this case, an entire city of millions may suffer.

*Eng. News, Oct. 3, 1907, p. 363.
†Eng News, March 5, 1908, pp. 264-265.

...TTERS TO THE EDITOR.

A... g for Length of Straight Frog Rail in Calculations for Turnouts.

S... e note the letter you publish in your issue of the ... last. from Mr. E. T. Abbott, of Thrall, Cal., in ref... to frog leads, and the question of considering th... ght portion of the lead in the frog and in the sw... point.

... refer Mr. Abbott to Engineering News of Ap... 1898, which gives an article titled, "Simple an... urate Rules for the Computation of Shortened Sw... Leads," by Wellington B. Lee. This article not on... nsiders this question, but also gives very handy for... s for figuring both the curved and straight lead an... dius for the correct curve to come tangent to the he... of the switch and toe of the frog. The Ramapo Iro... Works have, through courtesy of the Engineering N... issued this article in pamphlet form for distribution among their friends and customers.

... so note Mr. Abbott speaks of a standard frog being 1... long. This is all right for spring frogs; but for r... frogs there are only a few roads that have this for their standard length, except for frogs No. 10. One-and-a-half times the frog number makes a very desirable length, giving ample room for the splice bars in all numbers of frog. Many roads take 8, 9 or 10 ft. as a minimum length of frog. Where the frog is one-and-one-half times the number, the spread at heel between gage line is usually made 12 ins. and at the toe 6 ins., giving the length from the theoretical point to the heel the same in feet as the number of frog, and from the theoretical point to the toe end, in feet, one-half the number of the frog. This would make the No. 9 frog Mr. Abbott mentions, 13 ft. 6 ins. long, and would throw only 4 ft. 6 ins. of the frog into the lead.

Where large angle frogs as No. 6 are being used with 12 or 15 ft. straight switches, it is most essential in figuring these to consider the straight portion of the frog and the switch. If the turnout switch-point is curved back of separation of heads, as is often done, the formulas in the article referred to will still hold if one considers the length of the switch as the distance from separation of heads of switch rail and stock rail to the switch point, and the spread of the switch should also be taken at this point.

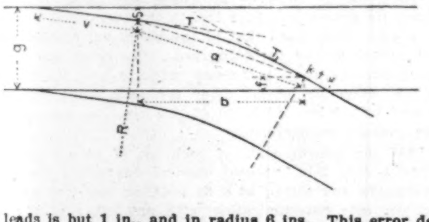
These formulas have proved very useful to the writer and should be very instructive to your readers if inserted here.

Yours very truly,
James B. Strong, Assoc. M. Am. Soc. C. E.,
Ramapo Iron Works.

Hillburn, N. Y., Aug. 14, 1908.

[The formulas referred to are as follows.—Ed.]

To compute the leads a and b and the radius R by exact methods, requires the use of trigonometrical functions, and preferably a table of logarithms, so the writer has developed a set of arithmetical formulas which gives surprisingly accurate results. With a No. 4 frog the error



in leads is but 1 in., and in radius 6 ins. This error decreases as the frog number increases, until with a No. 10 frog it is but 1/16-in. in leads and 1¾ ins. in radius.

There is generally given, gage of track, g; vertex to heel of switch, v; spread at heel of switch, s; vertex to toe of frog, t; spread at toe of frog, f. Then,

$$\text{Switch number, } n = \frac{v}{s}$$

$$\text{Frog number, } N = \frac{t}{f}$$

$$d = g - (s + f)$$

$$a = 2d \frac{n\,N}{n + N}$$

$$b = \sqrt{a^2 - d^2}$$

$$R = a \frac{n\,N}{n - N}$$

Sir: Referring to Mr. E. T. Abbott's letter in your issue of Aug. 13, if he will look on page 385 of Tratman's "Railway Track and Track Work," (second edition), he will find a treatment of this problem, giving approximate formulas.

The following formulas may also be of interest, using the same lettering as Tratman:

$$B = 2\,R \sin \frac{1}{2}\,(C -- S) \cos \frac{1}{2}\,(C + S).$$

$$R = \frac{D}{2 \sin \frac{1}{2}\,(C \frac{1}{2}\,S) \sin \frac{1}{2}\,(C + S).}$$

$$\cos C = \frac{R \cos S - D}{R}$$

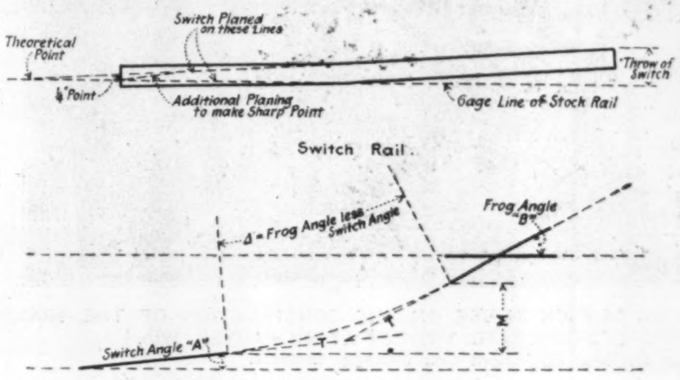
$$Lead = L \cos S + B + P$$
$$= L + B + P \text{ nearly.}$$

Yours truly,
R. Fleming Arnott.

93 Liberty St., New York City, Aug. 17, 1908.

Sir: As a reader of your publication for the past dozen or more years I have observed a number of articles on the question of switch leads, and in none of them does it appear to me that the subject is handled in a manner which will enable the beginner to work out these leads so as to make them applicable to the particular switches and frogs with which he may be compelled to work.

I inclose two sketches which show the problem reduced to the simplest form, and which problem may be stated briefly to be as follows: With a given switch and a given frog to introduce a curve extending from the heel of the switch to the toe of the frog so as to use a curve of uniform radius. One of the first problems is to determine the angle of the switch, and this is a subject which never seems to be touched upon. The upper sketch will show the manner in which the switch is made. It will be noticed that the rail is bent in such a manner that when the rail is planed to the respective gage lines it leaves a blunt point of



Switch Lead Diagram.

usually ¼-in., so that the theoretical point is some distance beyond the physical point. The actual details of the planing will, of course, vary with the individual manufacturers or the specifications of the purchaser. If the switch angle is not known it can be obtained by placing the switch rail against another rail, measuring the throw of the switch at the heel and deducting the thickness of the blunt point, from which the angle can be calculated, knowing the length of the switch rail.

Most of the articles proceed on the theory that the curve of the lead ends at the point of the frog, but usually the frog is made straight. The physical point of the frog is usually what is known as a half-inch point, so that the actual point of frog is some distance ahead of the physical point; with this in mind the actual distance to the toe of the frog and its throw can be determined. A glance at the lower sketch will readily show that the tangent distance of the curve that is to connect the switch and frog is a function of the distance M, which is the gage less the sum of the throws of the switch and frog, and it will be readily seen that this tangent distance T is

$$T = \frac{M}{\sin A + \sin B}$$

The other details of the lead can then be determined.

From the above any combination of switch and frog lead can be arranged, and usually the ones most likely to be used are calculated and tabulated. After the theoretical leads are determined practical leads can be arranged to best suit the length of rails and number of cuts required. Above No. 6 frogs a small variation in the length of lead will not make much difference, and convenience in the matter of cuts would be the determining factor, but below No. 6 no variation can be made. The writer has used frogs as small in number as No. 2½, but these as well as No. 3 and No. 4 frogs had the curve carried through the frog; and in one case a set of three were laid so close together that the heel rails of the frogs had to be bent to form the stockrail for the next. In this case we used No. 3 frogs with 7-ft. switches, so it will be seen that all the necessary functions had to be closely worked out.

Yours truly,
D. Hain,
Supt. of Construction, Altoona & Logan Valley Electric Ry Co.

Altoona, Pa. Aug. 15, 1908.

Sir: Regarding tables pertaining to turnouts for railroad track, noted by Mr. Abbott in your issue of August 13th, 1907: Many of the published tables in the hand books seem to be a survival of the days of the stub switch and very short frog. Railways now generally calculate their own tables based on the dimensions of their own track standards, and all recent ones coming to my notice figure the curve to be from the heel joint of the switch to the joint connecting the frog, and this very materially sharpens the radius of the turnout curve. The correct method is shown on page 385 Vol. 9 of Proceedings of American Railway Engineering and Maintenance of Way Association. Yours truly,

O. K. Morgan.

Johnson City, Tenn., Aug. 19, 1908.

[A small pamphlet entitled "Modern Turnout Formulas," written by Prof. Wm. G. Raymond, now of the State University of Iowa, Iowa City, and published by C. A. Worden, Troy, N. Y., in 1903, covers this subject, and includes consideration of the three-throw switch. A table of switch lead elements calculated from the formulas is appended to the text.—Ed.]

Notes and Queries.

L. M. M., of Watertown, Wis., sends a newspaper clipping which refers in the following terms to deviations of the plumb-line:

A remarkable instance has been found in the island of Porto Rico, where the deviation from the vertical is so great that in mapping the island the northern and southern coast lines as shown on the older maps had each to be moved inward half a mile.

He inquires whether this is not overdrawn, and asks for other instances of large error due to deviations of the plumb-line.

It has been called to our attention that the Bazin formula for flow of water in open channels given in our editorial columns of Aug. 13, 1908, p. 179, should have $\sqrt{r}$ in the denominator of the fraction instead of the $\sqrt{s}$ as given, thereby agreeing with M. Bazin's opposition to the use of the slope in the coefficient, as noted in his letter. The formula should read:

$$v = \frac{87\sqrt{r\,s}}{1 + \frac{m}{\sqrt{r}}}$$

This formula, but transformed to English measure, is given in the eighth edition of Merriman's "Treatise on Hydraulics," Art. 115, not Art. 118, as stated in the text.

THE INTERNATIONAL CLASSIFICATION OF causes of death, originally known as the "Bertillon System," is now in use by every country in North and South America, by Japan, France, Spain, Holland, Belgium, Greece, Bulgaria, and other European countries, and has recently been adopted by the new Commonwealth of Australia. Aside from the use of this classification by the United States Bureau of the Census, it has been adopted by each of the registration states of this country and by many of the registration cities. The classification will be revised in 1900, in accordance with a scheme for decennial revision. At the last revision, which was made in Paris, August, 1900, representatives of 26 countries took part. The foregoing information was taken from Public Health Reports of the U. S. Public Health and Marine-Hospital Service.

A NEW TYPE OF TORPEDO has been invented by Lieut.-Commander Cleland Davis, U. S. Navy. The torpedo contains a tube of vanadium steel weighing about 40 lbs. When the torpedo strikes the side of a vessel, a shell is discharged from this tube, through the opening made in the vessel, with a velocity of 600 ft. per sec. This shell is charged with high explosives and equipped with a time fuse, so that when it reaches the interior of the vessel, which it will do, as it has sufficient velocity to penetrate the bulkheads and the coal, it will explode, doing the greatest possible damage. In this way the protection supposed to be afforded a vessel by the water-tight compartments, bulkheads, and layers of coal is overcome, and, of course, much greater damage done than when the explosion takes place on the outside of the vessel or perhaps a few feet in. In a trial at Sheep Island, in Massachusetts Bay, Aug. 12, a torpedo of the Davis type was sent 120 ft. to a steel tank 15 ft. in diameter with three bulkheads of ⅝-in. plate, and the torpedo shell passed entirely through the tank and bulkheads, going 100 ft. beyond. There was no explosive in the shell used in this trial.

A NEW DESIGN OF CONVERTIBLE STIFF LEG AND GUY DERRICK.

In the use of derricks on excavation and construction work, either the guy type or the stiff-leg type of derrick may be best adapted to local conditions. The machine shown in the accompanying cut is specially designed to be convertible into either type, as required. This is effected by the use of special interchangeable fittings, so that only a small number of extra parts is required to change the derrick for different classes of work. The machine can be adapted for use in excavating as well as for handling material. Two lines are then led over the boom for operating the grab bucket. The line for the topping-lift, which raises and lowers the boom, is led up to the head of the mast and thence across to the head of the boom.

The derrick is swung by means of a bull-wheel, which is built of steel and is adaptable to derricks of various sizes. This obviates the necessity of using tag lines on the boom. Stay or guy rods run from the rim of the wheel to the sides of the boom. The boom can be swung through an arc of about 270°. The casting for the mast bottom and step have chilled wearing surfaces running in grease or oil, and the step is fitted for two sheaves. The boom is fitted to iron straps pivoted to the mast bottom. The top casting on the mast has an attachment for a top or "rooster" sheave; this is used for the boom line when the machine is arranged to operate a grab bucket. The block of the topping lift is attached to this casting by a short chain. The cap of the boom is of annealed crucible steel, and is attached to the boom by steel side plates with through bolts. The end thrust, however, is received entirely by the cap, so that there is no pressure on the bolts which might tend to split the timber. The blocks for the hoisting and topping lines are attached to the cap by steel links and pivots. The sheaves are made for use with wire-rope, and have self-lubricating graphite bearings.

These derricks are built by the National Equipment Co., of Chicago. The machine shown in the cut is one of two in use by the Newton Engineering Co. in the construction of the reinforced-concrete viaduct at Grand Ave., Milwaukee, Wis. (Engineering News, Feb. 14, 1907). Both of these are equipped as stiff-leg derricks. The hoisting capacity is 6 tons. The working radius is from 12 ft. to 38 ft., and the vertical lift is about 30 ft. when using the large drop-bottom buckets which are shown. These buckets are used for handling both excavated material and concrete.

The derrick shown is operated by a Mead-Morrison electric hoist of 20 HP., using 500-volt direct current. It has two drums, and on one shaft is a reversible winch, and on one end of one shaft is a special reversible winch for swinging the derrick. The other shaft carries an ordinary winch head besides the drum. In addition to the ordinary band brake, there is an automatic brake to prevent the drums from backing in the event of current being accidentally cut off while the machine is hoisting a load. The operating levers for the controller, the clutches and the brake are arranged very much as in a steam hoist.

A NEW DESIGN OF ELECTRIC DERRICK IN USE ON THE CONSTRUCTION OF THE GRAND AVE. REINFORCED-CONCRETE VIADUCT AT MILWAUKEE, WIS.
The National Equipment Co., Chicago, Builders.

THE PUECH ROUGHING FILTERS OF THE DERWENT VALLEY WATER BOARD, ENGLAND.

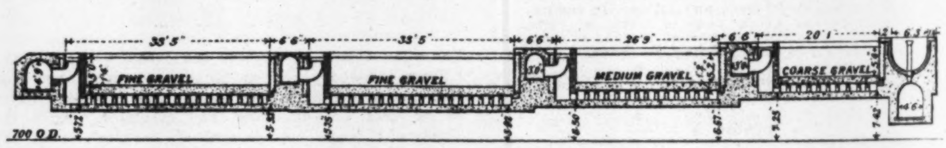
In our issue of March 26, 1908, there appeared, in the course of an article by Mr. Ad. Kemna, of Antwerp, on "Novelties in Filtration and Their Theory," an interesting general description and discussion of rapid multiple filters for the treatment of water preliminary to ordinary slow sand filtration. It appears that a number of these filters, originally devised by Mr. Armand Puech, a cloth manufacturer, of Mazamet, France, and subsequently perfected in their engineering details by another Frenchman, named Chabal, have been installed at various places.

A plant of the Puech system is about to be installed by the Derwent Valley Water Board, at Bamford, England. This board, it may be explained, was organized a few years ago to develop and supply water to Sheffield, Derby, Nottingham and Leicester. The board is building works which will have an ultimate capacity of some 43,200,000 U. S. gals. per day. For the present only one-third of this capacity is being provided. Connected with the works will be a slow sand filtration system, which in general follows the ordinary English practice. As a preliminary to the sand filtration, the water will be treated on the Puech roughing filters, of which there will be an area of ⅔ of an acre, as compared with 4⅓ acres of slow sand filters, to treat 14,400,000 U. S. gals. per day.

Mr. Edward Sandeman, C. E., is Chief Engineer of the Derwent Valley Water Board. Mr. Herbert Lapworth, Assoc. M. Inst., C. E., is Resident Engineer, with Mr. Andrew Williamson, Assoc. M. Inst. C. E., as assistant to the latter. In "London Engineering" for July 24, 1908, there appears an article by Mr. Williamson describing the whole filtration scheme.

We reproduce herewith a cross-section of the roughing filters, and quote from "Engineering" as follows:

> The filters are arranged in four sets, each consisting of four compartments, of similar depth and length, but of different breadths, placed one behind the other, with inter-joining channels. There are thus 16 beds, and, as it will not be necessary to clean more than one at a time, there will always be 15 in working order.
>
> Each compartment has a false bottom of wrought-iron perforated plates (6 ft. 8 ins. × 3 ft. 4 ins. × ⅛-in. thick). These are supported on rolled steel cross-tees (... × 3 × ⅜-in. × 6 ft. 8 ins. long) placed across dwarf concrete walls, 6 ins. thick and capped with ashlar, running the length of the compartment. The floor is of 6 to 1 cement concrete 1 ft. thick, with a ¾-in. lining of asphalt; it has a falling gradient away from the inlet end in the direction of the length of the compartment, and at the lower end a fall of 2 ins. in the breadth towards the delivery-chamber in the opposite corner. At the inlet end there is a shallow trough of masonry, separated from the gravel by a partition wall; also two 12-in. sluice-valves which connect, for cleaning purposes, the channel outside with the floor below the gravel. The outlet end is provided with a chamber opening out from the underside of the perforated plates, and therefore only open to the filtered water. In this chamber are fixed five delivery-pipes, each 6 ft. in circumference. The lips of these pipes are horizontal, 1 ft. 3 ins. below the top of the coping of that compartment, and 6 ft. 9 ins. above the floor of the chamber. There is a sump in this chamber, and the water from underneath the gravel can be drained off when required into the waste-water culvert, through a 12-in. sluice. The dwarf concrete walls, which form narrow channels, have openings at their lower ends, through which the effluent flows to this delivery-chamber. Also at the lower end, but in the opposite corner, there is another sump, with a 12-in. sluice, which leads the water from above the gravel into the waste-water culvert. This sluice, and the one in the delivery-chamber, are only used for draining the water away when the bed is being cleaned. A waste-water culvert is built under the center wall of each two sets of roughing filters, and has two 12-in. pipes cutting through its arch and draining into it from each compartment on either side. At the junction of the two culverts a 30-in. cast-iron pipe carries the water away to waste. Each of the compartments, therefore, is provided with penstocks and valves for the admission of impure water, and for the discharge of dirty water when cleaning the beds; also with delivery-pipes for the escape of the outlet. The second compartment has a similar false bottom, the perforations of which are $^5/_{16}$-in. in diameter. Its gravel is 1 ft. 2 ins. in thickness, and is sifted to a size larger than that of the holes, but smaller than the gravel in the preceding bed. The third and fourth compartments have perforated wrought-iron sheets with $^3/_{16}$-in. diameter holes. They are each filled with fine gravel 1 ft. 4 ins. thick, sifted to a size less than that in the second compartment.
>
> Past the outside ends of each set of roughing filters runs a 2-ft. 2-in. covered channel connecting the compartments and acting as a by-pass, so that any one can be put into communication with any other of the set, or can be shut off and isolated. The effluent from a compartment passes through its delivery-pipes into this channel, from which it can enter any of the remaining compartments, or successive combination of them, or, instead, flow direct to the sand-filter channel. For example, the water may run through the first into the second, from there half into the third and half into the fourth, thence to the sand-filter channel; or it may go from first to third or from inlet to second, and to the third or fourth and on to the sand-filter channel. This allows any one of the filters to be cleaned without in any way interfering with the filtration of the other beds.
>
> In general the raw water is discharged from the Bamford syphon through a bell-mouthed stand-pipe into the inlet-chamber and channel to the roughing filters, the flow being controlled by a 36-in. manual valve. From the inlet-channel the water flows over two 10-ft. weirs, through a 3-ft. penstock, on to a trough in the first compartment. This it overflows, and runs over the



CROSS-SECTION OF PUECH ROUGHING FILTERS, DERWENT VALLEY WATER BOARD, ENGLAND.

coarse gravel, upon which it deposits its coarsest impurities, and then passing through the perforated wrought-iron bottom, flows into the chamber containing the delivery pipes, through which it is discharged into a covered channel. From this channel it can be turned into No. 2 compartment, where it filters through the medium gravel, leaving there some of the impurities not retained in the first compartment; then through the delivery pipes into another covered channel. It next filters through No. 3 or No. 4 compartment, or half the quantity may go to No. 3, and half to No. 4, where the fine gravel retains most of the remaining suspended impurities, and it is then discharged through the delivery-pipes into the covered channel leading to the sand filters.

After a time, according to the condition of the raw water, the gravel gets too thickly clogged with deposited matter for the water to filter through at the required rate under the head available—about 9 ins. It is then necessary to thoroughly cleanse the bed, which is done as follows:

The compartment is isolated by closing the entrance penstock, and the water above and below the gravel is drained off through the two 12-in. sluice-valves at the lower end. A trench is dug in the gravel at the outlet end, the perforated plates being uncovered at the bottom, and a strong jet of water from a hose is played on the whole depth of the gravel thus exposed. This trench is worked forward until the whole length of the compartment has been traversed. The dirty water, together with the slime removed, flows through the perforated bottom, and is drained off by the 12-in. sluice-valves; at the same time the plates are also thoroughly cleansed.

It will be seen that every part of the filter can be inspected without expense or difficulty, and without the necessity of stopping the operation of the apparatus. As the washing is done *in situ*, none of the dirty filtering material has to be lifted out, as in sand filters, and the spaces ordinarily required for dumping and storing of old and new material for the filter-beds are dispensed with.

The aeration of the water is considerable, thus assisting in its purification. It is also claimed for roughing filters, in combination with fine-sand filters, that the acreage required to filter a given quantity of water is considerably reduced, and sedimentation basins can be dispensed with, so that possibly 10 to 15% may be saved on capital outlay.

The rate of filtration through the first compartment with the roughest gravel is about 22,800 U. S. gals. per sq. yd. per 24 hrs. [110,000,000 U. S. gals. per acre]; that is to say, 1 in. in depth will take 3 mins. to sink through the gravel. The area of the finest gravel is about 3½ times that of the coarsest, which layer the water would therefore take 3½ times as long to pass through; that is, 1 in. in depth would filter through the fine gravel in about 10 mins.

The slow sand filters have a combined area of 21,000 sq. yds.; or, allowing for one filter out of use, a working area of 18,000 sq. yds. This gives a working rate of 800 U. S. gals. per sq. yd. per day, or 3,870,000 U. S. gals. per acre. The filtering material proper consists of 2 ft. of washed sand, for which the specifications read:

Clean river, beach, or bank sand, entirely free from clay, dust, or organic impurities. It must not contain more than 2% by weight of lime and magnesia taken together and calculated as carbonates, and the grains must be all of hard material which will not disintegrate. The size of the grains must be such that all of the sand will pass through a screen with $^{3}/_{16}$-in. diameter holes; that at least 70% will pass through a sieve having holes $^{1}/_{25}$-in. sq.; and that at least 10% will pass through a sieve having holes $^{1}/_{70}$-in. sq.

The sand rests on 12 to 15 ins. of gravel, in three layers of different size, and the gravel is supported on hollow brick underdrains.

There is a small clear-water reservoir and the filtered water is measured by a Venturi meter.

As to the use of the Puech filters elsewhere "Engineering" says:

M. Puech's roughing filters were installed by Mr. W. B. Bryan, M. Inst. C. E., at the filters of the East London Water-Works, at Hanworth, near Sunbury, and it is understood they have given uniformly satisfactory results since their introduction. This is the only place in England where they are in use; but on the Continent they are working successfully at the Municipal Water-Works of Paris; at the water-works of the Suburban Water Co, at Surenses, near Paris; at Nantes, Cherbourg, Le Mans, Annonay, Toul, Nancy (France), Valencia (Spain), Tiflis (Russia), Ismailia (Egypt)., etc.

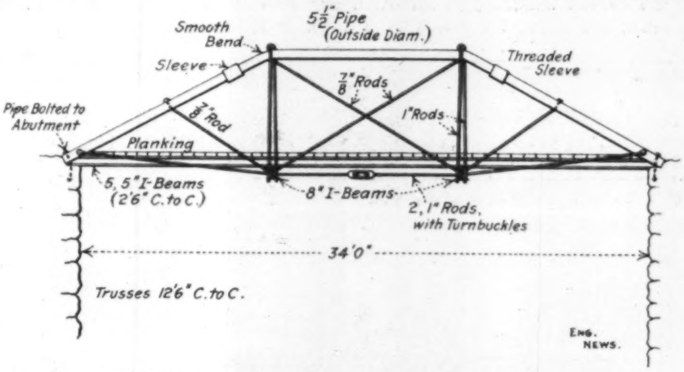
The East London works, we may explain, are under the control of the Metropolitan Water Board, London and vicinity, of which Mr. Bryan is chief engineer. We presume, but do not know, that some of the plants named are trial installations only. In Dr. Kemna's article (Eng. News, March 26, 1908,) it was stated that the Puech filters had been adopted for Madgeburg, on the Elbe.

The Puech filters, as compared with other types of roughing filters, with mechanical and with sedimentation, were discussed editorially in our issue of March 26, 1908, (already mentioned) under the heading, "The Removal of Suspended Matters from Water and Sewage."

A NOVEL HIGHWAY BRIDGE.

By F. M. GOODHUE*

The unusual in engineering, in so far as it is founded upon correct principles and in conformity to the limitations or possibilities of the material employed, should be of interest to every engineer. In these columns the writer has had the pleasure of calling attention to the unusual, once to a bridge at Lawrence, Mass., and again to other matters, and in this article he wishes to draw attention to a highway bridge discovered while upon a recent tour in the Berkshire Hills in western Massachusetts. The design violated no special engineering precept, the material was wood and iron, but it is not usual to see ordinary—except for size—pipe serving as the top chord of a bridge truss.



A NOVEL HIGHWAY BRIDGE AT WEST WORTHINGTON, MASS.

The sketch accompanying is self-explanatory, but the following details, provided by Willard Jones, postmaster at West Worthington, and a member of the Board of Selectmen that built the bridge, are of interest. The bridge spans the middle branch of the Westfield River at West Worthington; the designer is Charles Ball, now in business at East Windsor, Mass. Being in touch with the district, with its many and small streams and not over rich town treasuries, he invented the bridge described as one that for a minimum of cost presented a maximum of service and efficiency. It would seem these things were realized, for the bridge illustrated only cost about $200, while bridge companies that bid upon the work asked double that amount or more; it has stood without repair for at least 15 years, with the exception of an occasional coat of paint or the tightening of the turnbuckles.

The construction of the bridge offered no difficulty the town blacksmith and artisans could not surmount; in fact it is understood the entire construction was by town residents. The bridge proved so satisfactory that several were built; three alone being in the town of Worthington. Mr. Ball's reward from his invention was not what it should have been. It is stated the bridge companies seeing his bridge built so often, "froze" him out, and after regaining their market, calmly put up prices to the old notch.

A 30-FT. BRICK WALL, which was being put up for a building in Chelsea Square, Chelsea, Mass., collapsed Aug. 25, burying 20 workmen, eight of whom were killed. The wall was being erected on the site of a building destroyed by fire last April.

*42 Broadway, New York City.

THE VOLATILE MATTER OF COAL AS EVOLVED UNDER DIFFERENT CONDITIONS.*

By HORACE C. PORTER† and F. K. OVITZ.‡

In connection with the fuel investigations being conducted by the Technological Branch of the U. S. Geological Survey, an effort is being made to determine, among other things, the nature of the hydrocarbons which are given off from coal at a series of different temperatures, ranging from normal room temperature to that of the ordinary furnace.

In a series of experiments not yet completed, on the deterioration in heat value of various coals during storage under different conditions, a liberation of gas in remarkably large quantities was found in certain cases. About 25 lbs. of bituminous coal of buckwheat size was stored in a 5-gal. glass bottle closed with a rubber stopper, which was provided with glass tubes for removing gas samples.

The bottles stood in the laboratory at a temperature ranging from 20° to 25° C. In some of the bottles the coal was immersed in distilled water and the interstices well filled with water by attaching a partial vacuum for about one hour. About 400 cu. cm. of air remained above the surface of the water.

The gas liberated during these experiments consisted almost entirely of methane with a very slight amount of CO_2 and no more than doubtful traces of CO and heavy hydrocarbons. No hydrogen could be detected by the palladium fractional combustion method. Whether this gas may properly be considered as volatile matter due to decomposition of the coal, or whether it is held in the coal as such by occlusion or absorption cannot be decided without further study. The fact that the oxygen of the air surrounding the coal was rapidly absorbed without forming CO_2 indicates a change of composition in the coal. It is reasonable to suppose that a larger quantity of gas escaped between the mining of the coal and the starting of the experiments than was measured during the experiments. The measurement of quantity of gas formed is therefore of little value. The gas pressure in the case of one coal immersed, reached at one time 7 ins. of mercury.

A series of experiments conducted primarily for direct weighing of moisture driven off from coal at 105° C. yielded results incidentally which showed the extent of the loss of substances other than moisture, principally CO_2 in small percentages.

In studying the nature of the volatile matter at the medium and higher temperatures (500° — 1100° C.), two sets of experiments were run using different apparatus. In one a small sample (ten grams) was heated in a platinum retort suspended in an electric resistance furnace maintained constant at the desired temperature, the gases evolved being collected by displacement of water in a bottle. No attempt was made in this set of experiments to duplicate the methods of industrial practice. The apparatus was designed with the idea of maintaining definite and controllable conditions which would yield results comparable with each other in experiments on different scales. The other set of experiments was run on a somewhat larger scale, heating 400 grams of coal in a cast-iron retort resting in a cylindrical electric resistance furnace, the tar, water, ammonia, CO_2, H_2S, and gas being collected in appropriate absorption apparatus and measured. Owing to the heavy nature of the retort and the large sample of coal the temperature in the coal could not be varied as easily in these experiments as in those using the platinum retort. Accordingly one set of conditions was adopted approximating as nearly as possible those of industrial by-product coke oven practice, and a number of typical coals compared under these conditions. The object was rather to compare the different coals with each other under this set of conditions, than to determine absolutely the industrial by-product yields; and further to determine the composition of the volatile matter from different coals under these conditions.

The series of tests on ten grams of coal in a platinum retort, at various temperatures, is not yet completed but has yielded sufficient results to show their approximate agreement with those obtained on 400 grams of coal and also to indicate the composition of the gas produced from different coals in the early stages of heating at low temperatures. A thermo-couple was inserted in the retort so as to determine the temperature under the surface of the coal itself. The tests were run in an atmosphere of nitrogen which was passed through the retort until the exit gases contained less than 1% oxygen. The tar was collected in two 6-in. tubes of absorbent cotton heated to 100° C. The water was collected in a 5-in. $CaCl_2$ U-tube, and always contained a slight amount of light oil driven over from the tar causing an error of 1% or less.

From the results given in the table it may be seen that the low temperature gases are high in illuminants and the higher homologues of methane, and low in hy-

*Abstract of a paper presented at the June meeting of the American Chemical Society.

†Fuel Testing Laboratories, Carnegie Technical Schools, Pittsburg, Pa.

‡Carnegie Technical Schools, Pittsburg, Pa.

ABSOLUTE QUANTITIES OF SMOKING AND NON-SMOKING PRODUCTS IN TEN MINUTES' HEATING, TEN GRAMS COAL.

Designation of coal	Temperature: Furnace	Temperature: Coal	Tar (%)	Smoking products Gas (cu. cm.): Illum.	Ethane etc.	Total	Non-smoking gases (cu. cm.): CO_2	CO	CH_4	H_2	Total
Connellsville, Pa.	500	336	....	0	0.6	0.6	2.4	0.5	0.5	0	3.4
Ziegler, Ill.	500	325	....	0	0	0	13.5	4.7	7.2	0	25.4
Connellsville, Pa.	600	441	4.9	16	46	62	12	11	71	4	98
Ziegler, Ill.	600	440	6.8	12	39	51	28	25	33	5	91
Connellsville, Pa.	700	562	11.0	42	103	145	18	31	256	78	383
Ziegler, Ill.	700	545	7.8	24	0	24	40	64	231	5	391
Sheridan, Wyo.	700	580	8.2	50	69	107	294	204	190	154	842
Pocahontas, W. Va.	700	599	4.2	30	109	139	13	27	300	192	532
Connellsville, Pa.	800	687	12.6	76	166	242	21	95	343	456	917
Ziegler, Ill.	800	680	9.3	47	76	123	47	200	346	420	1,013
Sheridan, Wyo.	800	...	7.9	48	72	120	355	381	254	534	1,524
Pocahontas, W. Va.	800	...	6.5	54	186	240	19	77	390	691	1,177

ANALYSIS OF COAL USED IN EXPERIMENTS.

	Moisture.	V. M.	F. C.	Ash.
Connellsville, Pa.	1.10	30.67	60.35	7.88
Ziegler, Ill.	7.67	30.38	54.32	7.63
Sheridan, Wyo.	9.15	39.93	42.92	8.00
Pocahontas, W. Va.	.35	20.93	75.51	3.21

drogen. Comparing the four coals at 700° (565° in the coal) where the gas begins to be formed in considerable amount, the Connellsville is the richest of the four coals in illuminants and heavy hydrocarbons and the Pocahontas the highest in hydrogen. The high CO_2 and CO from the Illinois and Wyoming coals accords with other experiments on these coals. The tar at 700° is greater also in the Connellsville coal. The smokeless character of the Pocahontas coal may be connected more or less with the presence of considerable hydrogen in its gas at low temperatures, since the low ignition point of hydrogen tends to assist in the burning of other gases present.

The smoke producing constituents of the volatile matter are here considered as including tar, and the heavier hydrocarbon gases; benzene, ethylene and homologues of methane (calculated as C_2H_6). While at 440° (in the coal) the Illinois coal (and probably also the Wyoming) has produced more smoky gases than the Eastern coals, at 565° and higher the Connellsville produces much more. This accords with the finding in practice of greater difficulty in burning coals of the Connellsville type without smoke.

CONCLUSIONS.

Some coals liberate gas during storage, of a composition similar to that of natural gas, and some coals rapidly absorb oxygen from the air during storage without forming CO_2.

During drying in air at 105° C. some coals lose appreciable amounts of CO_2, and most coals take up oxygen to a considerable extent, but none of those tested showed any considerable formation of combustible gases.

The nature of the volatile products distilled from several coals at low temperatures in the early stages of heating varies in different coals in accordance with their smoke producing tendencies.

The volatile matter of coal comprises a considerable proportion of non-combustible matter varying with the type of coal.

A modification is suggested of Dulong's heat value calculation for coal based on experimental results showing the distribution of oxygen between hydrogen and carbon.

AN EXAMPLE OF THE DECOMPOSITION OF CONCRETE IN SEA WATER.

In many of our past issues we have discussed the effect of sea-water on concrete structures and reprinted letters describing the experience of various engineers in this matter, but never before, we believe, have we been able to show such a marked case of disintegration as is illustrated in the accompanying views of the sea-wall to some docks in the Charlestown Navy Yard at Boston, Mass. These arches are of non-reinforced concrete, some 20 ft. wide, and form the curved boundary to an earth and rock filled dock, the filling for which tails down under the arch. The portion shown in the views was built in 1901, under the direction of the Bureau of Yards and Docks of the U. S. Navy Department, a bureau that has a reputation for the most careful and thorough work. We are not able to procure any definite information as to the conditions of material and workmanship from any one who was connected with the work during construction, but through the courtesy of Mr. Fred Thompson, M. Am. Soc. C. E., Civil Engineer, U. S. N., now the engineer officer of the navy yard, we have procured the photographs herewith reproduced and such information as the records of the office show.

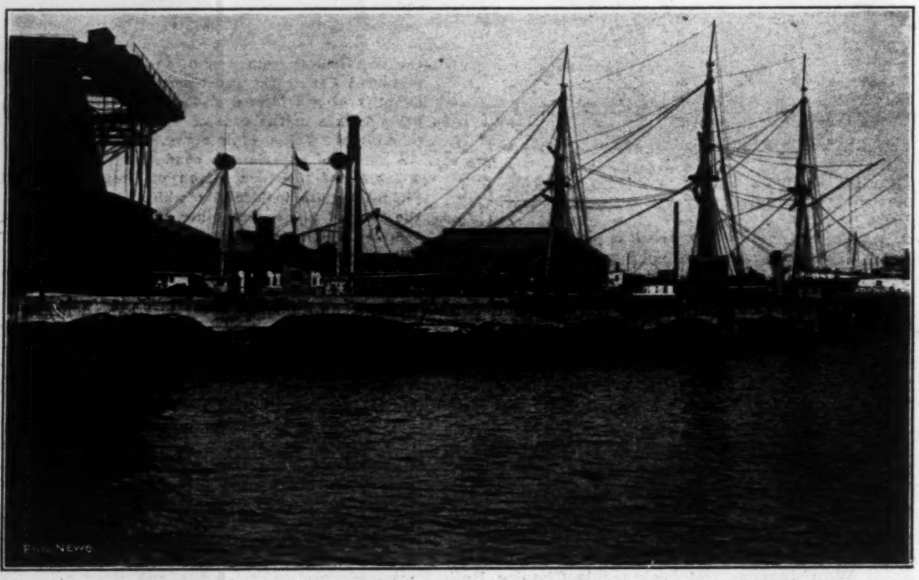


FIG. 1. DOCK WALL AT CHARLESTOWN NAVY YARD, BOSTON HARBOR.

The docks are located in the tidal salt water of Boston Harbor, which at this point is not highly polluted with sewage or factory waste, but which is subjected to considerable freezing weather and a 10-ft. range of tide. The concrete portion of the docks, built seven years ago, was constructed with all the care for which the Bureau is noted. The specifications call for continuous construction from pier to pier of the arch rings and for a 3-in. 1:1 mortar face on all exposed surfaces. The mass concrete was a 1:2:4 mixture for 2 ft. back of the face and 1:3:6 for the interior, a standard cement and a local gravel being used. For the cement, all the usual specifications were prescribed with the following interesting clause:

The contractor must furnish satisfactory evidence of the durability in sea-water of the brand of cement he proposes to furnish.

In the construction the arch ring was first laid and after it was completed the shown spandrel walls built, the whole being of the ordinary well-tamped concrete so much used at that time.

The photographs show without much further explanation the present condition of the face of the arches. It will be noted that the line of the extrados of the arch and the horizontal places where the parapet work stopped are both plainly marked in the decomposition. This rotting has extended for a considerable distance back into the concrete mass so that the mortar face alone is not responsible for the damage.

The government authorities on the work have no explanation to make of the cause of the disintegration, merely giving the facts in the case. It is well to note, however, that the decomposition occurred in probably a porous concrete, as it was mixed and laid dry with no especial effort toward density or waterproofing, and that the structure is in tidal sea-water, subjected to alternate freezing and thawing and finally that the damage has been done mainly between the high and low water levels.

NOTES FROM ENGINEERING SCHOOLS.

HARVARD UNIVERSITY.—A Graduate School of Business Administration will be opened Oct. 1, under the direction of Prof. E. F. Gay. This new school, for admission to which at least a bachelor's degree is necessary, will comprise a two years' course leading to a degree of Master in Business Administration and representing work in the fields of banking and finance, accounting and auditing, insurance, industrial organization, transportation, commercial law, economic resources and public service. The other faculties of the university will be utilized for special instruction in any particular branch of study which the student's future work may demand.

CORNELL UNIVERSITY.—A school of sanitary science and public health is to be established, with the cooperation of the State Department of Health. For the present the instruction will be limited to a course of lectures given at intervals beginning Oct. 8, 1908, and ending Jan. 14, 1909. President Schurman is reported as having expressed to Dr. E. H. Porter, Commissioner of Health, the hope that in time this "tentative course" may "develop into a great State school for sanitary science and public hygiene." Besides lecturers drawn from the university faculty and from the State Department of Health, a number of specialists from Europe will take part in the course. In the list of lectures thus far announced (Bulletin New York State Department of Health, July, 1908), the sanitary engineering topics are notable by their absence. Perhaps this is because of the fact that the various phases of this subject are already covered in the Engineering Department.

UNIVERSITY OF ILLINOIS.—The School of Railway Engineering and Administration, which was established two years ago and which is intended to stand midway between the College of Engineering and the Department of Economics, is being gradually enlarged. According to a recent statement from the University the organization of this school within the College of Engineering at present consists of an

Associate Professor of Railway Engineering, in general charge, and especially concerned with the problems of railway equipment; an Assistant Professor of Civil Engineering, especially concerned with problems of the track; an Instructor in Railway Mechanical Engineering, especially concerned with locomotive performance and train resistance; and an Associate in Railway Engineering, especially concerned with the specialized problems of electrical traction. Its organization within the Department of Economics consists of a Professor of Railway Administration and an Instructor in Railway Accounting.

To the general faculty have recently been added Mr. F. D. Crashaw, as Assistant Dean of the College of Engineering, Mr. S. S. Roberts, as Assistant Professor of Railway Civil Engineering, Mr. William F. Schulz, as Assistant Professor of Physics, and Mr. K. G. Smith, as

Assistant Professor of Mechanical Engineering, in addition to nine other instructors and assistants. Prof. Crashaw has lately been Principal of the Franklin School at Peoria, Ill., Prof. Roberts has been engaged in active railway work, Prof. Schulz has been an instructor at the University of Illinois, and Prof. Smith has been with the Kerr Turbine Co. Prof. Frank B. Sanborn of Tufts College, has been granted a year's absence from that institution to take up the work at the University of Illinois of Prof. Ira O. Baker, who is absent on leave.

AN EXPLOSION IN THE MAYPOLE COAL MINE at Wigan, England, Aug. 18, entombed 70 miners, all of whom are believed to have perished, and started a fire in the mine. A report of Aug 20 states that it has been decided to flood the mine to check the progress of the fire.

A DYNAMITE EXPLOSION Aug. 22 in the tunnel being driven by the Philadelphia & Reading Coal & Iron Co. to connect the Raush Creek workings with the Brookside colliery, near Valley View, Pa., killed two men. The explosion is claimed to have been caused by lightning which was conducted into the tunnel along the rails. The men killed were working 1,300 ft. from the mouth of the tunnel, and were engaged in preparing the charge when the lightning struck. The other workmen had retired in anticipation of the setting off of the charge.

THE CORBETT DIVERSION DAM, a part of the irrigation structures pertaining to the Shoshone project of the U. S. Reclamation Service, near Cody, Wyo., was finished in 1907 at a total cost of $66,750 and has recently been made the subject of a cost-data report by the service.

The report states that the dam is of the reinforced-concrete buttress type, having a deck 30 ins. thick on the upper side with a slope of 1 on 1. This deck rests on buttresses 2 ft. thick, spaced 14 ft. on centers. The structure is founded on gravel and shale, and has a reinforced-concrete platform 2 ft. thick resting on the foundation and extending from the deck wall down stream to a distance of about 40 ft. Beneath the deck of the dam and this platform are three cut-off walls running lengthwise of the dam and extending down into the shale. The total length of the dam between abutments is 400 ft., and extending at the right abutment of the dam to the bluff is an earth embankment about 450 ft. in length.

Careful records of cost were kept during the construction of this structure, and the data relating thereto are tabulated in the accompanying table under the primary heading of distribution of cost and under the secondary headings of the class items of the schedule. Labor conditions were extremely bad during the entire construction period, but the contractor was provided with fairly efficient equipment. Laborers were paid at the rate of $2.50 to $3.00 per eight-hour day; carpenters at the rate of $3.00 to $4.50, and teams at the rate of $2.50.

There was no suitable sand for concrete in the vicinity of the dam, and it was necessary to establish a crushing plant for manufacturing the same from cobblestones. The crusher and concrete mixer were located at a distance of about 400 ft. from the right abutment of the dam. The concrete was hauled from the mixer to central points on the dam by means of cars of one-half cu. yd. capacity drawn by horses. At these central points the concrete was transferred to small hand carts, and thus conveyed to various local points on the dam.

THE CUNARD LINER "LUSITANIA" has again broken all previous records for the trip across the North Atlantic. The passage of Aug. 16-20 from Daunt's Rock, England, to Sandy Hook, N. Y., over the short course, was made in 4 days 15 hours. This lowers her former record by 3 hours and 40 minutes. From noon of Aug. 16 until noon Aug. 17, the liner traveled 650 nautical miles, exceeding by seven miles her best previous performance. The average speed for this day's run was 25.66 knots, while that for the entire trip was 25.05 knots.

A RECORD RAINFALL ON THE PANAMA CANAL occurred on Aug. 7 at Bohio when, between 2:30 and 5:30 p. m., 7.62 ins. of rain fell. The storm lasted from noon until about 9:45 p. m., during which time the fall was 8.82 ins., with maxima for 10 mins. and for 1 hr. of 1.15 and 4.50 ins., respectively. The 24-hr. record between midnights was 10.98 ins. Although concentrated at Bohio, the storm spread all over the Isthmus with its worst portions at points where no excavation was being carried on, hence with the exception of some trouble with sunken tracks and the ordinary difficulty of handling mud the work continued the next day as usual.

THE BOILER EXPLOSION at York, Pa., which was noted in our issue of Aug. 13, has been pronounced by the coroner's jury to have been due to the negligence of the owners, the Susquehanna Iron Co. The jury found that on the day of the accident there was absolutely no way of telling how many pounds of steam the boiler was carrying and that the shell had been pitted and corroded to such an extent that in many places it was not more than $^1/_{16}$-in. thick. To this, and the employment of incompetent men to operate the boiler, the jury attributes the explosion.

THE HIGH-PRESSURE GATES in the outlet tunnel of the Shoshone Reservoir have been successfully installed, and on Aug. 15 water was flowing through the tunnel. Since these gates were described in our issue of Jan. 2, 1908, it is only necessary to add here that each of the three cast-iron sluice-gates has a body 7½ ft. long and 4½ ft. wide and closes a waterway 7 ft. x 3⅝ ft. in section. Each gate weighs about 10,000 lbs., sustains a water pressure of about 440,000 lbs., and will require for operation a lifting force of about 120,000 lbs. The work is being carried out by the U. S. Reclamation Service.

FLOODS FROM HEAVY RAINS did great damage in North and South Carolina Aug. 25, the result of continuous rains in the preceding 48 hours. Over a score of lives were lost. At Camden, S. C., it is reported a toll bridge was washed out and 19 persons who were standing on the bridge watching the flood were drowned. Several railway bridges and many culverts on the Southern Ry. and the Seaboard Air Line Ry. were destroyed. The operation of water-power plants is interrupted, and there is much loss from the consequent failure of electric power and light service. Heavy rains affected the upper Atlantic States on Aug. 26, but with less serious damage.

DEFIANCE OF THE PUBLIC SERVICE COMMISSION is the latest product of the receivership of the street railways in the boroughs of Manhattan and Bronx, New York City. The receivers of the Metropolitan Street Railway Co. were recently ordered by the Commission to agree on a joint rate with the Central Park, North & East River R. R. Co., as a substitute for the previously existing transfer arrangement, which ceased a few weeks ago when the receivers abandoned operation of the latter line and the lease thereby becoming void the line was resumed by its owners. The State law requiring issue of transfers between intersecting lines of a single company becoming inoperative, to restore the traffic conditions existing in the past the Commission ordered a joint rate to be arranged before Aug. 25. On the latter date the roads reported a refusal to establish such a rate. Apparently much of the difficulty is due to a difference of opinon as to how the original fare is to be divided, the Central Park, North & East River holding that the fare should be divided half and half, while the Metropolitan believes that it furnishes the longer haul and should therefore receive more than half of the transfer fare. But in the return to the Commission's order, the Metropolitan receivers go farther, and state that they will not enter into any joint fare arrangement as it is certain to prove unprofitable. This makes a direct re-

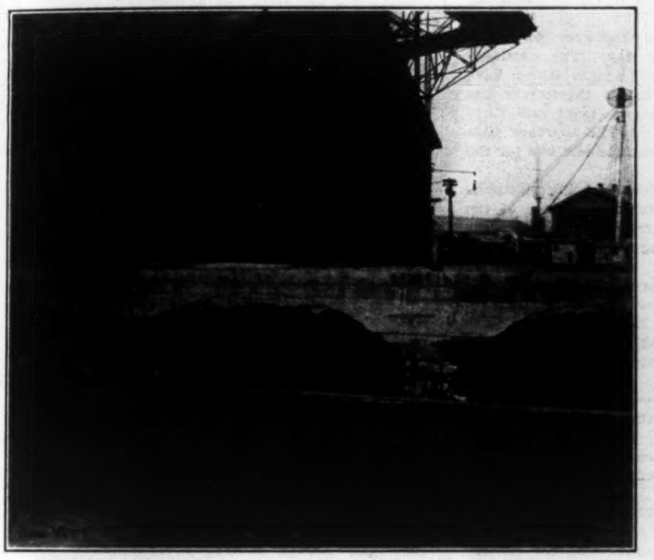


FIG. 2. NEAR VIEW OF DECOMPOSED CONCRETE SEA WALL IN BOSTON HARBOR.

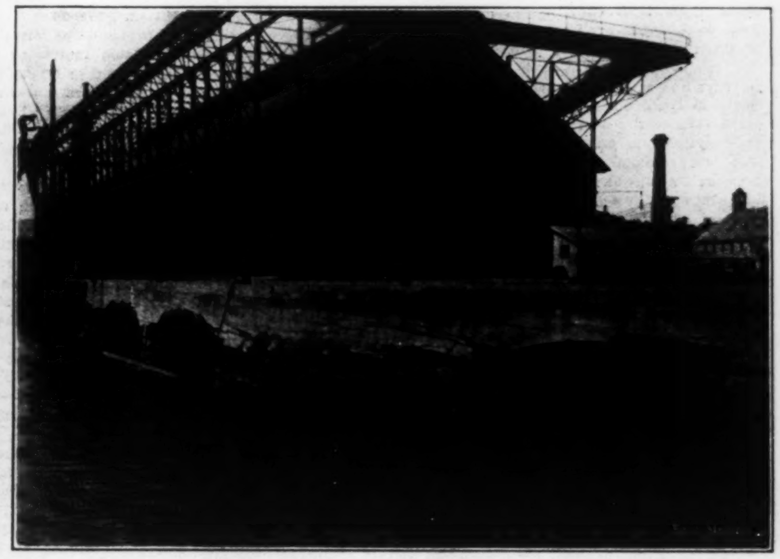


FIG. 3. ANOTHER VIEW OF CHARLESTOWN NAVY YARD DOCK WALL.

TABLE OF COSTS OF CORBETT DIVERSION DAM, CODY, WYO., U. S. RECLAMATION SERVICE.

Distribution of cost.	Excavation, Class 1, 7,865 cu. yds.		Excavation, Class 2, 2,681 cu. yds.		Excavation, Class 3, 1,454 cu. yds.		Puddling, 1,712 cu. yds.		Reinforced concrete, 4,950.59 cu. yds.		Hauling and placing reinforcing steel, 319,382 lbs.		Hauling and placing cast iron, 39,385 lbs.	
	Total.	Unit.	Total.	Unit.	Total.	Unit.	Total.	Unit.	Total.	Unit.	Total.	Unit.	Total.	Unit.
Interest on investment	$347.00	$0.044	$354.00	$0.132	$380.00	$0.261	$72.00	$0.042	$1,675.00	$0.338	$145.00	$0.0004	$27.00	$0.0007
Preparatory expense	420.00	.053	430.00	.163	482.00	.332	89.00	.052	2,068.00	.418	177.00	.0005	34.00	.0009
Plant depreciation	347.00	.044	354.00	.132	380.00	.261	72.00	.042	1,675.00	.388	145.00	.0004	27.00	.0007
Executive	1,137,00	.145	1,165.00	.434	1,246.00	.857	240.00	.140	5,553.00	1.122	473.00	.0013	91.00	.0023
Labor	7,466.63	.948	7,660.79	2.853	8,214.07	5.648	1,631.25	.953	32,831.54	6.632	2,582.06	.0084	620.07	.0164
Supplies	262.65	.035	262.62	.097	262.62	.181	......	......	4,950.70	1.000	......	......	......	......
Total contractor's cost	$9,980.28	$1.269	$10,226.41	$3.811	$10,964.69	$7.541	$2,104.25	$1.229	$48,753.24	$9,848	$3,522.06	$0.011	$799.07	$0.021
U. S. materials	8.28	.001	8.29	.004	8.28	.006	......	......	24,369.55	4.925	7,275.76	.022	5,074.67	.129
U. S. engineering	408.15	.052	465.04	.175	555.81	.383	44.63	.026	2,156.90	.436	321.55	.001	230.52	.005
Total actual cost	$10,396.71	$1.322	$10,699.74	$3.990	$11,528.78	$7.930	$2,148.88	$1.255	$75,279.69	$15.209	$11,119.37	$0.034	$6,104.26	$0.155

fusal to comply with the Commission's order. The matter will probably be decided by litigation. The receivers deny that their action is due in any sense to a feeling of being under the protection of a Federal court and therefore not amenable to State administration. Judge Lacombe has already said, in a memorandum to the receivers before their present refusal, that the question of their control by the Public Service Commission is wholly in the jurisdiction of the State courts. It has been suggested that the receivers will attack the constitutionality of the Public Service Commission law, in so far as it confers the authority exercised in the present case, on the ground that the compulsion of transferring in the face of the receivers' opinion that it can not be made profitable would amount to confiscation.

THE VENTILATION OF THE NEW YORK SUBWAY has just been made the subject of a report by Mr. Bion J. Arnold, the consulting engineer who was called in by the Public Service Commission to investigate the various deficiencies in that road. After a brief statement of the well-known superheated condition of the tube, Mr. Arnold suggest four ways available for reducing the temperature of the air to that of the street or lower: First, refrigeration; second, cooling by water; third, blocking open the automatic louvres installed about two years ago as a relief measure, and fourth, building a center wall between opposite-direction tracks so as to create "piston ventilation." The first of these is condemned as too expensive and the second also on account of the physical limitations in procuring cool water at reasonable cost. The two last methods are recommended as feasible and desirable. The automatic louvres are shutters in the side of the subway opening into the street and so arranged that they open upon sufficient air pressure being created by an approaching train, allowing the heated air to be discharged. However, on account of the slow speed of the trains and the conflicting air currents, there is frequently insufficient pressure to open them so that they are in operation only about 25 per cent. of the time. To remedy this, Mr. Arnold recommends that the louvres be kept open all day, allowing street air to enter and at night be arranged to operate in the originally designed manner when the fans are being run, so as to remove the heated air, which, when blown out in the daytime, is offensive to passersby on the street. The last recommendation that a center wall be built between the up-town and down-town tracks, is expected to reduce the temperature markedly by creating a current of air through the tube in the direction of the trains, drawing fresh air from the station entrances and pushing foul air ahead to be expelled. The details of this wall are given as follows:

Between 96th St. and Brooklyn Bridge this wall for controlling the air movements should be constructed on the center line of columns between the express tracks. The H-section plate and angle columns in the Subway are well adapted for the construction of a 4-in. terra cotta block wall laid in cement mortar, between the columns. This type of wall would be very strong and would strengthen the present structure. A concrete wall would be satisfactory, but more expensive, and would not serve the purpose for which the wall is installed to any greater advantage. It would, however, be more effective as a guard in case of derailment of trains. It is essential to have the wall continuous so as to prevent any by-passing or short circuiting of the air. Between stations it may be left in the rough, but for the sake of appearance in front of the stations it should be smoothed with cement mortar. At stations and wherever necessary, vertical counterweighted sliding doors could be installed to allow passage for employes, and if thought advisable, the upper half of the wall at stations could have vertical counterweighted sliding windows for observations at stations. As the express trains do not run in the early morning hours, this wall could be put in quickly. While it would stop employes working in the Subway stepping between center columns to escape the trains, it does not make a dangerous condition, as they could use the space between the local and the express tracks the same as is now done in any place where two-track construction is used. The cost of a 4-in. terra cotta block wall between 96th St. and Brooklyn Bridge should not be over $76,000, or $2.25 per running foot. The cost of a concrete wall in the same section should not be over $130,000, or $3.85 per running foot.

Finally, the report recommends the installation of large disk fans at 14th St. and Grand Central stations to cool the platforms and the construction of as many protected openings as practicable between the subway and the street. The report is now in the hands of the Public Service Commission for possible future action.

THE SOUTHWEST LAND TUNNEL of the Chicago water-works is making good progress. Its speed of advance is of interest in connection with other rock-tunnel records, recently reviewed in these columns, and with the rates of progress attained in the Gunnison and Bitter Root tunnels. While the tunnel is somewhat smaller than a railway tunnel, its maximum size is a horseshoe section 14 ft. × 13 ft. 8 ins., and it is in this section that the highest record has been made. The maximum monthly progress was made in June, being in drift 21 of Section No. 3. This record was 390 ft., made by working two groups of men in two ten-hour shifts. The daily average was 13.4 ft. for 29 working days. This work was under the direction of Mr. Daniel O'Connor, as Superintendent. The maximum daily average was 16.4 ft., made by the same force on June 30. The gang for each 10-hour shift was made up as follows:

1	Foreman	1	compressor engineman
4	drillers	1	electrician and helper
4	driller helpers	1	blacksmith and helper
1	nipper	1	machinist and helper
13	muckers	1	powder man
1	cageman	1	pump man and helper
4	top men		
		38	Total.

The excavation is carried on by a top-heading 9 ft. high kept about 12 ft. in advance of the bench, which is shot each day. For drilling the heading there are four Ingersoll-Rand drills mounted in pairs on two columns. Each set of holes consists of 8 cut holes 9 ft. deep, 6 helper holes 7 ft. deep, and 12 rim holes 7 ft. deep. The drills are then turned over on the columns and four bench holes are drilled. About 250 lbs. of 60% gelatine dynamite are used to make an average progress of 7 ft. The rock through which the tunnel is driven is a hard limestone. The length excavated to July 31 was as follows: Section 1, 18,841 ft.; Section 2, 18,880 ft.; Section 3, 1,168 ft. This tunnel was described in an issue of Nov. 14, 1907.

For the above information as to the records we are indebted to Mr. Geo. F. Samuel, Assistant Engineer in the Department of Public Works, who is in charge of this tunnel.

THE LARGE EAST RIVER BRIDGES, New York City, progressed as follows during the past quarter:

Blackwell's Island Bridge.—The erection of the superstructure was completed on June 15, 1908. Some masonry work is required to finish the main and anchor piers. Work on the approaches is progressing, and the steel viaduct work will soon be fully connected. Contracts for the inner trolley tracks, the roadway pavement and the footwalk flooring have been let and the work is in progress. The work remaining to finish the structure will be let soon.

Manhattan Bridge.—The steel towers were completed ready for the cable contractor in May. The construction footbridges, used in laying up the main cables, have been erected, and work on the cables themselves has been begun. Nearly 1,000 wires of the main cables are already in place, out of some 30,000. The approach sites have been practically cleared and the foundations for the viaducts are being built.

Brooklyn Bridge.—The railway floor is being strengthened by putting steel I-beam stringers in place of the wooden stringers. The shuttle-train service over the bridge railway tracks (connecting with the Brooklyn elevated lines), which hitherto was substituted for through traffic during the rush hours in order to gain capacity, has been abandoned since the completion of a tail-switching extension at the Manhattan end. The practicability of the change being established, the old shuttle cars were sold and the cable-haulage equipment removed from the bridge.

THE COLOGNE BRIDGE ACCIDENT, reported briefly in our issue of July 16, 1908, p. 71, involved the loss of 8 lives. The accident is remarkable in the fact that the temporary work which failed was a steel truss bridge 200 ft. in span, forming part of the centering of a steel arch 541 ft. in span. The centering at either side of the truss consisted of pile trestle; the truss span had the object of leaving a channel clear for navigation, this channel being used by boats bound upstream, while a channel in another part of the bridge served for boats bound downstream. The 200-ft. truss span, specially built for this work, had already been criticised by the public authorities as too weak, and had been strengthened. The "Zeitschift des Vereines Deutscher Ingenieure" suggests that either the strengthening may have been insufficient or else certain of the upper laterals of the span had been removed to facilitate the erection of the arch members, although there were also rumors that a settlement of the pile-cluster end supports of the truss span had been produced as the result of scour by the current of the river. The normal depth of water is about 20 ft. The truss bridge comprised two parallel-chord Pratt trusses set 39 ft. on centers; the truss depth is about 26 ft., and the panel-length about 24½ ft. (eight panels, with a very short end-post panel at either end). All members were detailed as rigid members, composed of steel shapes; the joints appear to have been bolted. At the time of the accident the span was carrying less than half its full erection load. A gantry traveler, consisting of two A-shaped side-frames connected by a portal construction, and about 100 ft. in total height, was standing on the span at the time of the accident.

A CREOSOTED WOOD CONDUIT has recently been removed from Sixth Ave., New York City, after 21 years' use, and has been found to be in excellent condition. This conduit, a 24-duct run, the product of the Wyckoff Pipe & Creosoting Co., was placed in 1887 and had to be removed this year in the excavation for the Hudson River tunnels. It is in as good shape as when laid and is being stored for possible future use.

PERSONALS.

Mr. O. O. Winter, General Superintendent [illegible]e Grand Trunk Pacific Ry. Co., has resigned. He [illegible] be succeeded by Mr. H. H. Brewer, formerly S[illegible]ntendent of the Lake Superior Branch. Mr. Brewer's [illegible]quarters will be at Winnipeg, Man.

Mr. Arthur L. Walker, M. Am. Inst. M. [illegible] has been appointed Professor of Metallurgy at Colu[illegible] University to succeed Prof. Henry M. Howe, M. A[illegible] Inst. M. E. Professor Howe will continue to lecture [illegible]on and steel. Mr. Walker graduated from the Colu[illegible] School of Mines in 1883.

Mr. J. G. Holcombe, M. Am. Soc. C. E., [illegible] resigned the position of Division Engineer in charge [illegible] he Municipal Engineering Division of the Isthmian [illegible]al Commission to accept the office of Chief Engineer [illegible] Director of Public Works of the Republic of Pa[illegible]a. Mr. Holcombe was at one time Chief Engineer of [illegible] Philippine Government.

Mr. E. J. McCaustland, M. Am. Soc. C. E., M. Am. Inst. M. E., has been appointed Professor of [illegible]unicipal Engineering at the University of Washington, Seattle. Mr. McCaustland has previously taught as an Assistant Professor at Cornell University and as Professor of Mining Engineering at the University of Alabama. He has been principal Assistant Engineer in charge of track work in connection with the recent track elevation in Chicago.

Obituary.

T. Edward Lamb, Assoc. M. Can. Soc. C. E., of the firm of Laurie & Lamb, consulting engineers, Montreal, died Aug. 13, at Caledonia Springs after a brief illness.

A. J. Bailey, formerly Superintendent of the Bridge and Building Department of the Grand Trunk Ry., died Aug. 14 at Toronto, Ont. Mr. Bailey retired about twelve years ago from the employ of the Grand Trunk Ry., for whom he had worked for 43 years. He was 74 years old at his death.

Isaac H. Sturgeon, who organized the North Missouri R. R. in 1857, died at his St. Louis home, Aug. 22. Mr. Sturgeon was born in Jefferson Co., Ky., in 1821. He was for ten years President and General Manager of the North Missouri R. R., and afterward assisted in organizing the Ohio & Mississippi R. R.

Joseph C. Hornblower, senior member of the firm of Hornblower & Marshall, architects, of Washington, D. C., died at The Hague Aug. 22. He was born at Paterson, N. J., in 1848, and graduated at Yale in 1869 with the degree of Ph. B. Mr. Hornblower was a Fellow of the American Institute of Architects and a member of several Washington and New York clubs.

ENGINEERING SOCIETIES.

COMING MEETINGS.

CENTRAL STATES WATER-WORKS ASSOCIATION.
Sept. 15-17. Annual convention at Pittsburg, Pa. Secy., Wm. Allen Veach, Newark, O.

NEW ENGLAND WATER-WORKS ASSOCIATION.
Sept. 23-25. Annual convention at Atlantic City, N. J. Secy., Willard Kent, 715 Tremont Temple, Boston, Mass.

AMERICAN INSTITUTE OF MINING ENGINEERS.
Sept. 29. Annual meeting at Birmingham, Ala. Secy., R. W. Raymond, 29 West 39th St., New York City.

LEAGUE OF AMERICAN MUNICIPALITIES.
Sept. 30-Oct. 2. Annual convention at Omaha, Neb. Secy., John MacVicar, Des Moines, Iowa.

ILLUMINATING ENGINEERING SOCIETY.
Oct. 6-7. Annual convention at Philadelphia, Pa. Secy., Van Rensselaer Lansingh, Engineering Societies' Building, 33 West 39th St., New York City.

AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION.
Oct. 12-16. Annual convention at Atlantic City, N. J. Secy., B. V. Swenson, 29 West 39th St., New York City.

RAILWAY SIGNAL ASSOCIATION.
Oct. 13-15. Annual meeting at Washington, D. C. Secy., C. C. Rosenberg, 12 North Linden St. Bethlehem, Pa.

ASSOCIATION OF RAILWAY SUPERINTENDENTS OF BRIDGES AND BUILDINGS.
Oct. 20-22. Annual convention at Washington, D. C. Secy., R. H. Reid, Lake Shore & Mich. Southern Ry., Cleveland, Ohio.

AMERICAN SOCIETY OF MUNICIPAL IMPROVEMENTS.
Oct. 20-23. Annual meeting at Atlantic City, N. J. Secy., A. P. Folwell, 239 West 39th St., New York City.

AMERICAN ELECTROCHEMICAL SOCIETY.
Oct. 30-31. Fall meeting at New York City. Secy., Dr. J. W. Richards, Bethlehem, Pa.

CENTRAL RAILWAY CLUB.—The regular meeting and fall outing will be held at Buffalo, Sept. 11. There will be a trip down Niagara River and around Grand Island. The meeting will be held on the boat while en route, and Mr. W. H. Evans, Master Mechanic of the International Ry. Co., will read a paper on "Electric Traction vs. Steam Railroad Operations."

CONSTRUCTION NEWS

Sup[illegible]nt to ENGINEERING NEWS. 220 Broadway, New York, August 27, 1908.

CONTENTS.

CONST[illegible]ON NEWS:
Plans [illegible] Specifications on File...... 73
List [illegible]ntracts Pending............ 73
Railw[illegible]............ 73
Electr[illegible]ailways 74
Light [illegible] Power Plants............ 74
Bridg[illegible]............ 75
Build[illegible]............ 75
Water [illegible]ply and Irrigation............ 76
Sewer[illegible]............ 77
Garba[illegible]isposal 77
Stree[illegible]d Roads............ 77
Manu[illegible]ring Plants 78
Misce[illegible]ous Contracts 79
U. S. [illegible]essions and Cuba............ 80
INDUS[illegible]AL NOTES 80
TRAD[illegible]BLICATIONS 80
PROPO[illegible]LS 80

CONSTRUCTION NEWS.

PLANS AND SPECIFICATIONS ON FILE.

(* denotes *that this work is advertised in Engineering News.*)

The following Plans (P.) and Specifications (S.) are on file and may be seen at the office of The Engineering News Publishing Co., 220 Broadway, New York.

Bids close.	Work. Place.	See issue.
8-29	Steel tank, Fort Barrancas, Fla. ....(P. & S.)	8- 6
9- 2	*Road, Jamesburg, N. J. (P. & S.)	8-13
9- 2	*Water tower, etc., Platte, S. Dak..........(P. & S.)	8-13
9- 4	*Channel, Boston, Mass (P. & S.)	8- 6
9- 5	Elevator, Bremerton Wash....(S.)	8-13
9- 5	Elevators, Norfolk, Va.......(S.)	8-20
9- 5	*Prison, Portsmouth, N. H...(S.)	8-13
9- 9	*Water pipe, Springfield, Mass.(S.)	8-13

LIST OF CONTRACTS PENDING.

LIGHT, HEAT AND POWER PLANTS.

8-29 Dam, Port Arthur, Ont.......... 8-27
8-31 Carbons, Winnipeg, Man......... 8-27
8-31 Elec. equip., Los Angeles, Cal.. 8-27
8-31 Power-house, Wheeling, W. Va.. 8- 6
8-31 Wiring, Washington, D. C....... 8-20
9- 8 Lighting, Kenosha, Wis 8-13
9- 9 Motor, Atlanta, Ga.............. 8-27
9-10*Elec. equip., White Plains, N. Y 8-27
9-10 Power-house, etc., Mansfield, O.. 8-27
9-14 Lighting streets, Hartford, Conn. 7-30
9-15 Elec. light plant, Winnipeg, Man. 7-30
9-19 Light plant, Tacoma, Wash....... 8-13

BRIDGES.

8-28 Superstructure, Towanda, Pa.... 8-20
8-28 Substructure, Irondale, Ohio..... 8-13
8-28 Bridge work, Columbus, Ohio.... 8-13
8-29 Bridge, Cleveland, Ohio.......... 8-27
8-29 Culverts, Indianapolis, Ind........ 8-13
8-29 Bridges, Lima, Ohio 8-20
8-31 Substructure, etc., St. Clairsville, Ohio 8-13
8-31*Bridge, Cuba (U. S. Possess.).... 7-30
9- 1*Bridge, Missoula, Mont........... 8-13
9- 1 Bridge, Two Harbors, Minn..... 8-20
9- 1*Superstructure, Russell, Mass.. 8-20
9- 2 Bridge, York, Pa................ 8-27
9- 2*Bridge equip., Chicago, Ill. 7-30
9- 5 Bridge, Cleveland, Ohio 8-20
9- 7 Superstructure, etc., Chillicothe, Ohio 8-20
9- 7 Bridge, Speedwell, Va........... 8-20
9- 7 Bridge, Beaver, Okla............ 8-27
9- 7 Bridges, Valparaiso, Ind......... 8-27
9- 7 Bridges, Columbus, Miss......... 8-27
9- 8 Bridge repair, Salinas, Cal..... 8-27
9- 8 Bridge, Rensselaer, Ind........... 8-20
9- 8 Bridge, etc., Salinas City, Cal... 8-20
9- 9 Bridges, Ithaca, N. Y........... 8-20
9- 9 Bridges, Ocala, Fla.............. 8-27
9-10 Bridge, Ashland, Ohio........... 8-27
9-10 Bridge, Monongahela, Pa........ 8-27
9-14 Bridges, Moscow, Idaho 8-20
9-15*Bridge, Amsterdam, N. Y...... 8-27
9-16*Bridge, Morenci, Ariz............. 8-13

BUILDINGS.

8-29 Buildings, Bremerton, Wash..... 8-20
8-31 Library, Hartford, Conn......... 8-27
8-31 Buildings, St. Paul, Minn....... 8-27
8-31*Heating, Washington, D. C..... 8-20
8-31*Stable, morgue, Washington, D. C.............................. 8-20
9- 1 Hospital, Minneapolis, Minn...... 8-20
9- 1 School plans, St. Paul, Minn.... 7- 9
9- 1 Bank, Joliet, Ill.................. 8-27
9- 1 School plans, Ogden, Utah....... 8-27
9- 1 Schools, Buckhannon, W. Va... 8-27
9- 1 Post-office, Greenville, Ohio.... 7-23
9- 1 Laundry, Columbus, Ohio (Mfg. Pl.) 8-13
9- 3*Buildings, Ft. Monroe, Va........ 8-13
9- 3 Hospital, Ft. Slocum, N. Y....
9- 4 Building, Batavia, N. Y......... 8-27
9- 5 Elevator, Bremerton, Wash 8-13
9- 5 Prison, Portsmouth, N. H........ 8-13
9- 5 Elevators, Norfolk, Va........... 8-20
9- 7 Asylum, Rochester, Ind.......... 8-20
9- 8*School, Cincinnati, Ohio......... 8-20
9- 8*Vacuum system, Wash., D. C... 8-13
9- 8 Building materials, New York... 8-27
9- 9 Court-house, Wash., Ind......... 8-27
9- 9*Post-office, Sheridan, Wyo........ 8-13
9- 9 Court-house, Washington, Ind... 8-20
9-10 Post-office, Kenosha, Wis........ 8-13
9-10 Y. M. C. A., Richmond, Va..... 8-27
9-11 Iron work, Washington, D. C... 8-27
9-12 Laundry, Ft. Bayard, N. Mex. (Mfg. Pl.) 8-20
9-14 Post-office, St. Louis, Mo........ 8- 6
9-14 Barracks, Boston, Mass.......... 8-27
9-15 Factory, Graham, Mo. (Mfg. Pl.) 8-20
9-16 Post-office, Youngstown, Ohio.... 8-13
9-17*Vault, Washington, D. C.......... 8-13
9-17*Post-office, Escanaba, Mich........ 8-13
9-18 Vacuum system, Rochester, N. Y. 8-20
9-21 Post-office, Little Rock, Ark..... 8-20
9-22 Post-office, Greenwood, S. C..... 8-20
9-22 Laboratory, etc., Ann Arbor, Mich. 7-23
9-23 Court-house, Green Bay, Wis.. 6-18
9-23*Houses, Wheeling, W. Va........ 8-27
9-23*Quarters, Ft. Hancock, N. J.... 8-27
9-24 Plumbing, Baltimore, Md........ 8-24
9-28*Post-office, Dalton, Ga.......... 8-20
9-29*Post-office, Bridgeton, N. J...... 8-20
9-30 Post-office, Cape Girardeau, Mo. 8- 6
10- 1*Post-office, Charlottesville, Va.. 8-20
10- 5 Post-office, Chippewa Falls, Wis. 8-27
10-10 Post-office, Butte, Mont........... 8-20

WATER-WORKS.

8-29 Water tank, Ft. Barrancas, Fla.. 8- 6
8-31*Canal, Portland, Ore.............. 8-13
8-31*Water mains, Wallingford, N. J.. 8-13
9- 1 Water-works, Russelville, Ala.... 8-13
9- 1*Concrete conduit, New York, N.Y. 7-30
9- 1*Filtration plant, Winnetka, Ill.... 8- 6
9- 1 Reservoir dam, Marysvale, Utah. 8-20
9- 1 Water supply, etc., North Chicago, Ill.............................. 8-20
9- 1*Pipe, etc., Livermore Falls, Me.. 8-20
9- 1*C.-I. pipe, Cincinnati, Ohio...... 8-20
9- 1 Water-works, Earlham, Iowa.... 8-27
9- 1Water-pipe, Gardner, Mass.........8-27
9- 2 Water-works, Warsaw, Ill....... 8-27
9- 2*Laying pipe, Boston, Mass....... 8-20
9- 2*Water tower, Platte, S. Dak...... 8-13
9- 3Water pipe, etc., New York, N. Y. 8-27
9- 3 Water system, Fort Sam Houston, Tex. 8-13
9- 4 Wells, Fort McPherson, Ga...... 8-20
9- 4 Standpipe, Manchester, Mass... 8-27
9- 5 Water cribs, Wellsville, Ohio... 8-27
9- 7*W.-Works, University, Ala...... 8-20
9- 8 Pump, Muskegon, Mich........... 8-20
9- 8 Water-works, Holyrood, Kan.... 8-27
9- 9*Pipe line, Springfield, Mass 8-13
9-10*Dam, Stamford, Conn............ 8-27
9-11 Hydrants, Portland, Ore.......... 8-20
9-13*Filter cleaning apparatus, Philadelphia, Pa. 8-20
9-16*Pipe, Morenci, Ariz............... 8-13
9-22*Filters, Reading, Pa............ 8-27
9-24*Filtration plant, Evansville, Ind.. 8- 6
10- 5 Well, Harrisonburg, Ga.......... 8-20
10-14 Cast-iron pipe, etc., Vancouver, B. C.............................. 8-13

SEWERS.

8-28 Sewers, Durango, Colo............ 8-20
8-28 Sewers, Sauk Centre, Minn....... 8-20
8-28 Drain, Rutherford, N. J......... 8-27
8-28 Drainage, etc., Chicago, Ill...... 8-27
8-31 Sewer, Frazeyville, Ohio.......... 8-13
8-31*Sewer, New Brunswick, N. J.... 8-13
8-31 Sewers, Ridgway, Pa............ 8-20
8-31 Sewer, Sterling, Colo............ 8-27
9- 1 Sewer pipe, New Orleans, La.... 8-27
9- 1 Sewer, Bound Brook, N. J....... 8-27
9- 1 Sewers, Lawrence, Kan.......... 8-27
9- 1 Sewer, Jackson, Ohio 7-23
9- 2 Sewer, Brooklyn, N. Y.......... 8-20
8- 3 Sewers, Point Pleasant, N. J..... 8-20
9- 4 Sewer, North Braddock, Pa....... 8-20
9- 5 Sewers, Lorain, Ohio............ 8-27
9- 7 Sewer, Kendallville, Ind......... 8-27
9- 7 Sewer system, Columbus, Ind.... 8-27
9- 7 Sewer, Mitchell, S. Dak......... 8-27
9- 7 Pipe sewer, etc., Cresco, Iowa... 8-27
9- 7*Sewers, Vicksburg, Miss.......... 7-30
9- 8 Sewer, Hackensack, N. J......... 8-20
9- 8 Sewer, Normal City, Ind......... 8-27
9- 8*Sewers, Saranac Lake, N. Y.... 8-27
9- 8 Sewers, Crookston, Minn......... 8-27
9- 8 Sewer, Hudson, Wis............. 8-27
9- 9 Sewers, Brooklyn, N. Y...........8-27
9- 9 Sewers, Brooklyn, N. Y.......... 8-27
9- 9 Sewer, Oakland, Cal............ 8-27
9-14*Sewer, Washington, D. C........ 8-20
9-14*Engines, Wash., D. C........... 8-13
9-15*Sewer, Peoria, Ill................ 8-27

STREETS AND ROADS.

8-28*Macadam, Montvale, N. J........ 8-20
8-28 Roadway, Columbus, Ohio 8-20
8-28 Road impvt, Cincinnati, Ohio...... 8-13
8-28 Grading, etc., Youngstown, Ohio. 8-27
8-29 Paving, etc., Harrisburg, Pa.... 8-27
8-29 Road, Williamsport, Ind.......... 8-13
8-31 Paving, Fort Edward, N. Y...... 8-13
8-31*Street impvt., Mineola, N. Y..... 8- 6
8-31 Paving, Appleton, Wis........... 8-20
8-31 Pavement, Petrolea, Ont......... 8-27
8-31 Grade, Regina, Sask............ 8-27
9- 1 Regulating, etc., Long Island, N. Y. 8-27
9- 1 Paving, etc., Philadelphia, Pa.... 8-27
9- 1*Paving, etc., Caney, Kan......... 8-20
9- 1 Paving, Beaumont, Tex.......... 8-20
9- 1 Paving, Defiance, Ohio 8-20
9- 2 Regulating, etc., Brooklyn, N. Y. 8-20
9- 2*Sidewalks, Pascagoula, Miss...... 8-20
9- 2*Macadam, Jamesburg, N. J....... 8-13
9- 3*Paving, Dublin, Ga.............. 8-13
9- 3 Paving, etc., New York, N. Y.. 8-27
9- 4 Road repair, Cincinnati, Ohio 8-20
9- 4 Pavement, Lewiston, Idaho.......8-27
9- 5 Roads, etc., Fort Mackenzie, Wyo 8-20
9- 5 Street impvt., Fond du Lac, Wis. 8-20
9- 5 Road, Terre Haute, Ind........... 8-13
9- 7 Road, Danville, Ind.............. 8-13
9- 7 Road, Liberty, Ind............... 8-13
9- 7 Road, Mankato, Minn............ 8-20
9- 7 Sidewalk, Osceola, Iowa 8-20
9- 7 Grading, etc., Ingram, Pa....... 8-27
9- 8*Paving, Muskegon, Mich.......... 8-27
9- 8 Resurfacing, Muncie, Ind.........8-27
9- 8 Roads, Martinsville, Ind.......... 8-27
9- 8 Roads, Rockville, Ind............ 8-27
9- 8 Road, Corydon, Ind............. 8-27
9- 8 Road, Vincennes, Ind............ 8-13
9- 9 Roads, Muncie, Ind.............. 8-13
9- 9 Regulating, etc., Brooklyn, N. Y. 8-27
9- 9 Road, Bloomington, Ind......... 8-27
9-10 Asphalt walks, New York, N. Y. 8-27
9-10 Road, Lafayette, Ind 8-20
9-11 Gravel, Cincinnati, Ohio......... 8-27
9-12 Grading, Cleveland, Ohio......... 8-27
9-14*Macadam, Decatur, Ala......... 8-20
9-18 Road, Huntington, Ind........... 8-27

MISCELLANEOUS.

8-28 Garbage, furnace (Garbage), Buffalo, N. Y..............................8-27
8-28*Cable, Wash., D. C.............. 8-20
8-28 Garbage removal, Reading, Pa.. 8-20
8-28 Dredging, Wapakoneta, Ohio.... 8-27
8-29 Ditch, Redwood Falls, Minn.... 8-20
8-29*Garbage removal, Youngstown, O. 7-30
8-31*Dredge, Petersburg, Va. 7-30
8-31*Cable railways, Panama 8- 6
8-31 Trolley material, Boston, Mass... 8-13
8-31 Riprap, Wilmington, N. C........ 8-13
8-31*Canal, Portland, Ore.............. 8-13
8-31 Dredging, Evansville, Ind...... 8-27
8-31 Concrete wall, concrete, Montreal, Que.............................. 8-27
8-31 'Phone system, Virden, Man......8-27
9- 1 Brick tunnels, Buffalo, N. Y.....8-27
9- 1 Steel rails, Trans-Continental Ry. 8-13
9- 1 Monument designs, Mexico 5-21
9- 2 Yellow pine, Leavenworth, Kan...8-27
9- 2 Hoist tower, Atlanta, Ga..........8-27
9- 3 Repairing fences, New York......8-27
9- 3 Gravel, New York..................8-27
9- 3 Cement, sand, New York.........8-27
9- 3 Hull, scows, Ottawa, Ont..........8-27
9- 4*Dredging, Plymouth, Mass....... 8- 6
9- 5*Lumber, etc., Charleston, S. C... 8- 6
9- 5*Dredging, Philadelphia, Pa....... 8-13
9- 5*Drainage, Annawan, Ill........... 8-20
9- 5*Drainage, Houston, Tex.......... 8-27
9- 5 Motor trucks, Washington, D. C..8-27
9- 7 Creosoted barges, Memphis, Tenn.8-27
9- 7*Embankment, Greenville, Miss.... 8-13
9- 8*Cement, Vicksburg, Miss......... 8-20
9- 8 Dredging, New Orleans, la......8-27
9- 8 Vacuum system, Harrisburg, Pa. 8-27
9- 9 Lumber, Washington, D. C..... 8-27
9- 9 Piles, Washington, D. C......... 8-27
9- 9Towboat, Cincinnati, Ohio......... 8-27
9- 9*Barge canal, Albany, N. Y...... 8-20
9- 9 Sale of railway, Atlantic & Lake Superior Ry. 7-23
9- 9 Sale of Ry., Baie des Chaleurs Ry. 8- 6
9-10 Concrete dam, Cincinnati, O......8-27
9-10*Lighthouse foundation, Wilmington, Del.............................. 8-27
9-12 Sale of electric railway property, Mt. Vernon, Ohio 8- 6
9-14*Dredging, New York, N. Y...... 8-20
9-14 Wooden wharf, Fort Sumter, S.C. 8-27
9-14*Dredging, Norfolk, Va........... 8-27
9-14 Lock gates, Winnipeg, Man...... 8-27
9-16 Levee, etc., Memphis, Tenn...... 8-27
9-16*Ry. work, Philadelphia, Pa...... 8-20
11- 2 Submarines, Wash., D. C.......... 8-13

FOREIGN.

10- 1 Railway material, Siam 7-16
10-14 Dredging, Spain 7-16
10-29 Reservoir, pipe, India............ 8- 6
11- 2 Electric plant, Chile............. 7-16
11- 4 Reservoir, India 8- 6
12- 1*Sewers, paving, Ecuador......... 8- 6

CIVIL SERVICE.

9- 2 Scientific Asst., Philippines 8-20
9- 2 Eng. Inspector, Wash., D. C.... 8-20
9- 3 Examiner Accounts, Wash., D. C. 8-20
9- 5 Rodman, Albany, N. Y.......... 8-20
9- 5 Asst. in Legislation, Albany, N. Y. 8-20
9- 9 C. E.-Supt. Constn., New London, Conn. 8-20

RAILWAYS.

ALTUS, ROSWELL & EL PASO.—H. H. Fielder, who, on Aug. 1, succeeded E. K. Stimson, as Ch. Engr. of the Altus, Roswell & El Paso Ry. Co., writes us that work is progressing rapidly. The first 35 miles of grading between Altus and Hollis, Okla., is now completed, averaging about 12,000 cu. yds. per mile; 3% maximum curvature and a 1% maximum grade. The line, as projected, runs southwest to Lubbock, Tex., in Lubbock County, and west to Roswell, N. Mex.; thence southwest to El Paso, Tex., traversing a rich farming section thickly settled throughout and as yet without railroad facilities. The line crosses the Salt Fork of the Red River four miles west of Altus, where there is to be a 1,700-ft. pile bridge; the bridging of the first 35 miles will average 150 bridge feet per mile. Company is now ready to let contracts for track laying complete with 60 or 65-lb. relay steel, together with bridging; track complete ready for rolling stock over the first division, Altus to Hollis, Okla., with option of continuing as work progresses or as grade is finished. Company invites correspondence from reliable contractors, with a view to bidding on this work. Engineers are now in the field moving toward Roswell. It is expected to soon start grading between Hollis, Okla., and Wellington, Tex., a distance of 25 miles, pushing work as rapidly as possible. Edward Kennedy is Pres.; H. H. Fielder, Ch. Engr., Altus, Okla. Noted on June 4.

APPALACHIAN RY.—This company has been chartered in North Carolina to build a line from Whittier, N. C., on the Southern Railway, across the Great Smoky Mountain, to Sevierville, Tenn., a total distance of 50 or 60 miles. Capital, $100,000. The directors are R. U. Shaffer, Pres., New York; S. E. Slaymaker, Vice-Pres., 309 Broadway, New York; George W. Lex, of Philadelphia, Secy.; John C. Arbogast, of Lake Charles, La., Treas. and Gen. Mgr. Henry B. Stevens, of Asheville, N. C., is General Counsel. The line will develop a large timber tract. It is announced that surveys for the road have been completed and everything is in readiness for the work of construction to begin. The road will pass through the valley of the Oconelufty River.

ATLANTA NORTHEASTERN.—Company has been granted its charter to build a line from Atlanta to Cumming, Ga., about 40 miles, via Alpharetta and Roswell. The line may use any motive power. Capital, $50,000. The incorporators are T. F. Martin and J. L. Murphy, of Atlanta; J. I. Teasley and J. P. Brooks, of Alpharetta; J. O. Crowley and C. C. Foster, of Roswell; C. L. Harris and W. R. Atwell, of Cumming, and F. C. Tate, of Jasper, Ga.

BALTIMORE & OHIO.—Company has been granted permission by the Commissioners, District of Columbia, to build its proposed branch from Linden, Md., via Chevy Chase Lake, to Georgetown, D. C., about seven miles. D. D. Carothers is Ch. Engr at Baltimore, Md. The new line is known as the Washington & Western Maryland Railroad.

DELAWARE, LACKAWANNA & WESTERN.—It is stated that a line between Clarks Summit and New Milford, Pa., which will eliminate the grades and curves between these two points, is to be built at an estimated cost of $7,000,000. It is second only to the $10,000,000 cut-off which will be built from Portland, Pa., to Hopatcong, N. J.

MATANE & GASPE.—The contract for 35 miles of line with sidings has been awarded to H. J. BEEMER & CO., Quebec. Hon. P. A. Choquette is Pres. of the railroad company, Quebec.

MEMPHIS, PARIS & GULF.—The Arkansas State Board of Railway has granted this company permission to extend its road from the present northern terminus at Nashville, Ark., northeast through Hempstead County to Murfreesboro, Pike County, 15 miles. Estimated cost, $15,000. The new line will connect with the Prescott & Northwestern at Tokie. This railroad now operates 27 miles of line between Ashdawn and Nashville, Ark. C. C. Henderson is Gen. Mgr., at Nashville.

MISSOURI.—At a recent meeting of the Rolla Commercial Club, representatives of the Commercial clubs of Houston and Licking, Mo., met jointly to consider the proposition of building a railroad from Rolla via Licking to Houston, Mo., a distance of 52 miles. A committee of the Rolla Commercial Club, consisting of Edwin Long, Charles L. Woods, W. C. Shanklin, Mayor Charles T. Strobach and F. E. Taylor, was appointed with the clubs of Houston and Licking in formulating a plan to secure a right-of-way, etc. The present plan is to build the road from Rolla to Houston, using the old Emerson survey along the ridge south and east of Rolla, passing Lacoma, Amutt and Licking.

*PHILADELPHIA & READING.—Bids are asked until noon, Sept. 16, by W. Hunter, Ch. Engr., 520 Reading Terminal, Philadelphia, for the following work appurtenant to the abolishment of grade crossings on the P. G. & N. R. R.: Contract No. 21—locomotive coaling station, Green St. Yard. Contract No. 31—coal pocket yard at northeast corner of Tenth and Norris Sts. Contract No. 32—masonry, embankment, paving, water and drainage systems and new freight office building in yard between Berks and Morris Sts., west side. Contract No. 35—drainage for yards between York St. and Cumberland St.

QUITMAN & GREAT NORTHERN.—We are officially advised that this company desires to correspond with construction company or reliable party regarding construction of the Quitman & Great Northern R. R. It will run from Mineola to Paris, Tex., 85 miles. Right-of-way is secured. Surveys are made and capital partly obtained. Contracts will be let at once. W. M. Lloyd is Pres.; T. H. McMichael is Ch. Engr.; both at Quitman, Tex.

SAN DIEGO, CUYAMACA & EASTERN.—This railway property was sold at auction on Aug. 17 at San Diego, Cal., to C. L. Bundy, of Santa Monica, Cal. The total amount bid for all the property sold was $101,525. The railway is 23 miles long.

SANFORD & EVERGLADES.—A company has been organized in Sanford, Fla., for building, managing and maintaining a railroad from Sanford to Lake Okeechobee. The proposed road will pass through the Counties of Orange, Osceola, Brevard, St. Lucie, De Soto and Dade, a distance of 250 miles. The authorized capitalization of the company is $50,000. The incorporators are A. T. Rossiter, S. O. Chase, J. N. Whitner, T. P. Forster and A. P. Connelly. The road will aid in developing a large area of country now to a great extent undeveloped. The headquarters of the proposed road will be located at Sanford. The officers at present are: A. T. Rossiter, Pres.; S. O. Chase, Vice-Pres.; J. N. Whitner, Secy.; F. P. Forster, Treas.; A. P. Connelly, Gen. Mgr. The directors are A. T. Rossiter, S. O. Chase, J. N. Whitner and F. P. Forster.

SOUTHERN PACIFIC.—The UTAH CONSTRUCTION CO., of Ogden, Utah, has been awarded contract to build a 32-mile low-grade new line from Rocklin, above Sacramento, to Colfax on the west slope of the Sierra. The new route is nearly all surveyed and that will provide a 1¼% grade, in place of the existing route, which is a 2 2-10% grade. It will be used for eastbound traffic and will require a year to build. Estimated cost, $2,000,000.

WASHINGTON & WESTERN MARYLAND.—See Baltimore & Ohio R. R.

ELECTRIC RAILWAYS.

ROCHESTER, N. Y.—The Rochester & Manitou Beach R. R. Co. has been incorporated as the successor to the Rochester, Charlotte & Manitou Beach R. R. Co. Capital stock, $60,000, including property formerly owned by the old company. Directors: Jacob Gerling, Charles S. Briggs, S. J. Scudder, Kendall B. Castle, Fred W. Odenbach, Henry W. Wedel, of Rochester; David Hyam and Allen J. Holloway, of Buffalo, and Frank Gellie, of St. Johnsville. As noted on Aug. 13, the "Rochester, Charlotte & Manitou R. R., extending from Rochester to Lake Ontario, eight miles, has been sold by the Receiver, W. Butler, Crittenden, to Kendall B. Castle, Attorney, Rochester, for $12,000, the purchaser assuming outstanding bonds of the company to the amount of $80,000, and receiver's notes for $8,000."

PATERSON, N. J.—At a recent meeting of directors of the North Jersey Rapid Transit Co., formed to build an electric railway from Suffern, N. Y., to Paterson, the following officers were elected: Pres., William A. Barbour; Vice-Pres., Malcolm R. McAdoo; Secy. and Treas., H. H. Parmalee. The company is capitalized at $2,000,000. We were officially advised, as noted on July 9, that "plans and specifications are being prepared by the New York & North Jersey Rapid Transit Co. for the construction of an interurban electric railroad between Paterson, N. J., and Suffern, N. Y., preparatory to letting contracts. M. R. McAdoo, Colt Bldg., Paterson, N. J., is Gen. Mgr."

IRWIN, PA.—It is stated that the Manor Valley Railway Co., which proposes building a line from this city to Herminie, Pa., a distance of six miles, is now receiving bids and that contracts for building the entire line, power-house, barns, etc., will be awarded at once. The company may extend the line later to West Newton and Claridge, but this will not be done until the Irwin-Herminie portion of the line is completed and in operation. The Manor Valley Co. is controlled by the Pittsburg & Westmoreland Ry. Co. T. Frank Wolf is Vice-Pres., Irwin, Pa. Officially noted on May 28.

DONORA, PA.—Council has finally passed the ordinance, and Burgess A. V. Lewis has signed it, giving the Donora & Eldora Street Railway Co. a franchise through this city. The company is required to file a bond for $5,000 as guarantee that work will be started within three months and that the road will be completed and placed in operation within a year. As noted on Feb. 6, 1908, "we are officially advised that the Donora & Eldora St. Ry. Co. will let contracts some time during the spring for building overhead line from Donora to Eldora, 3.3 miles. Surveys have been made and right-of-way obtained. Capital is practically secured. A 350-ft. viaduct will be built. There will be 38,000 cu. yds. of grading. B. M. Hanna is Pres., 718 Pennsylvania Ave., Pittsburg. R. W. Hervey is Secy., Monongahela, Pa. Gisli Gudmundson is Ch. Engr., Empire Bldg. Previously noted."

FREDERICKSBURG, VA.—We are officially informed that the same interests that own the Fredericksburg Power Co. own the Richmond & Chesapeake Bay R. R. and are the ones who applied to the Corporation Commission last fall for a charter to construct a line from Doswell, Va., to Fredericksburg, Va. The further development of the Rappahannock River will depend upon the steps taken to construct the electric line from Ashland, Va., to Washington, which is the ultimate destination of the above road. Wm. C. Whitner is the Ch. Engr. of the development at this point and is to be the President of the Fredericksburg & Southern R. R. All work here is to be done by company forces.

MOBILE, ALA.—It is announced that within two months surveys will be under way for the proposed electric railway to connect Mobile with Citronelle, Ala., 30 miles. Right-of-way has been secured. Over $500,000 will be spent. C. A. Elkins of Louisville, Ky., and Geo. S. Bressler, of Gulf Crest, Ala., are named as the promoters of this project. The name of the line will be the Mobile & Gulf Interurban Electric Ry. Co., it is said.

FERDINAND, IND.—The Ferdinand R. R. Co. has been organized to construct an electric railway from Ferdinand to Huntingburg, a distance of seven miles. It is to be completed by Jan. 1, 1909. Capital stock, $150,000. O. W. Blickenstaff, Lafayette, Ind.; D. H. Morgan, Brazil, Ind., and N. P. Carter, Indianapolis, are reported to be interested in this company.

HOUGHTON, MICH.—The Houghton County Traction Co., of Houghton, has contracted with the Stone & Webster Engineering Corporation, of Boston, for the extension of its lines from Wolverine, Mich., to Mohawk, Mich. The contract includes the construction of the track, bridges, overhead work, a car barn, a small substation and the purchase of some new cars. The work as planned will cost about $125,000.

OTTUMWA, IOWA.—John A. Nelson, Ch. Engr. of the Chicago, Ottumwa & Western Ry. Co., Hamilton, Iowa, advises us that this line will be 85 miles long and it will connect Ottumwa and Des Moines, via Hamilton and Dallas. Right-of-way is mostly secured. Surveys are partly made. It is proposed to do construction work by company's forces. T. J. Avery, Hamilton, is Pres. Noted on July 16.

GREAT FALLS, MONT.—We are officially advised that the County Commissioners have granted a franchise to operate an electric railroad on the roads of the county to G. Calvin Bower and associates. The surveys on nearly 100 miles of the road have been made. The line runs west from Great Falls, 60 miles, to Augusta, passing through the famous Sun River Valley and the Fort Shaw reservation, which has been irrigated by the U. S. Reclamation Service and is now being settled. At the town of Sun River, 19 miles west of Great Falls, the road branches and goes to Chouteau, the county seat of Teton County and a town of nearly 2,000 persons, at present without railroad facilities. The line runs north from there over the Burton bench, a famous irrigated wheat country, 18 miles long and 12 miles wide.

GAINESVILLE, TEX.—The Commercial Club is interested in the plan to build an electric railway from Gainesville to Chickasha, Okla., and has appointed Hon. W. H. O'Beirne, W. P. Blanton, T. E. Harbour and Secretary Sam J. Heim as a committee to take the matter up with the Commercial club of Chickasha.

HASKELL, TEX.—The Haskell & Rule St. Ry. Co. has applied for a franchise to construct an electric street railway from Rule to Haskell. J. H. Mahan is the promoter.

WATERVILLE, WASH.—James Fullerton, of Seattle, has applied for a franchise to build an electric railway from a point on the Columbia River up Grand Coulee, with a branch to Waterville.

EUREKA, CAL.—The Humboldt Transit Co. plans to issue $100,000 of bonds to improve its system. M. M. Martin is Mgr., Eureka.

CHICO, CAL.—The Northern Electric Ry. Co. is ready to proceed with the construction of the Colusa and Red Bluff extensions. The extension to Red Bluff will follow the east side of the Sacramento River and will pass through the Los Molinos colony tract. The distance to Red Bluff from Chico will be 41 miles, and from Marysville to Colusa the distance will be 22 miles. Surveys have been completed on both proposed lines, and part of the grading has been done. Right-of-way and franchises have been secured, and all is in readiness for the commencement of work. A. D. Schindler is Gen. Mgr., at Chico.

SALT LAKE CITY, UTAH.—Announcement is made that the Emigration Canyon R. R. Co. is completing a standard-gage electric railway from Salt Lake City to Emigration Canyon. The system will comprise about 14 miles of track. The overhead trolley system will be installed and current will be generated at Big Cotton Wood Canyon, where the company proposes to locate its power station. The repair shops will be built at Emigration Canyon. The company contemplates operating twelve cars. Capital stock, $300,000. Headquarters, 1337 East Fifth St., Salt Lake City. Le Grand Young is Pres.; O. W. Moyle, Vice-Pres.; Leslie G. Young, Secy.; Edgar S. Hitts, Treas.; Le Grand Young, Jr., Supt. and Ch. Engr.

COEUR D'ALENE, IDAHO.—A movement has been started among mining men in Central Idaho districts, backed by Spokane and Eastern capital, to build an electric railroad from Oro Grande and Elk City down the south fork of the Clearwater River to connect with a line from Camas Prairie to Lewiston. O. G. Kinney, Secy. of the Butte & Oro Grande Mining Co., is handling the interests of Idaho and Spokane. The road will be known as the Elk City, Lewiston & Spokane Electric Ry. Capital to amount of $200,000 has already been subscribed, it is said. Engineers will be placed in the field soon.

LIGHT AND POWER PLANTS.

(denotes that this work is advertised in Engineering News.)*

CENTERVILLE, MASS.—The contract for the raceway at Centerville has been awarded to NELSON A. HANKS & SONS, 245 Exchange St., Leominster, Mass., for $5,000. The raceway will furnish power for operating an auxiliary electric light plant, which is controlled by the Winchendon Electric Light & Power Co., of Winchendon, Mass. The chair plant of Clark & Beals, in Centerville, has been purchased by William M. Whitney, Pres. of the electric light company, and will be closed down and converted into an auxiliary for the lighting plant.

DANBURY, CONN.—The Danbury Agricultural Society has awarded a contract to FAIRBANKS, MORSE & CO., 32 Cortland St., New York, N. Y., to install an electric plant at the Danbury Fair Grounds to furnish electricity for 250 lamps. The equipment of the plant will include a 25-HP. gasoline engines with dynamo, which will be located on the north side of the grounds near the present boiler house. The plant will furnish electricity for motors for the exhibits about the grounds and buildings and will be ready for operation in time for the annual fair in October.

ARCADE, N. Y.—Contracts have been awarded to the WESTINGHOUSE ELECTRIC & MFG. CO., of Pittsburg, Pa., for electrical equipment, and to the RIDGWAY DYNAMO & ENGINE CO., of Ridgway, Pa., for an engine for the municipal electric light plant. H. B. Sweet, of Utica, N. Y., is Engr.

*WHITE PLAINS, N. Y.—Bids are asked by Chauncey T. Secor, Chn. of the New Court House Com., Bd. of Supervisors, White Plains, until 2 p. m., Sept. 10, for electrical equipment, engines and dynamos, to be used in the Supreme Court Building and Hall of Records. Lord & Hewlett, 345 Fifth Ave., New York, N. Y., are Archs.

FORT ANN, N. Y.—The Kane Falls Electric Co. has been granted permission by the Public Service Commission, Albany, N. Y., to construct an electric transmission line in the towns of Fort Ann and Kingsbury, Washington County, and Queensbury, Warren County, N. Y.

NEWARK, N. J.—The contract for the erection of the addition to the power plant at the penitentiary has been awarded to STORMS & CO., 126 South 14th St., Newark, N. J., for $13,454.

WASHINGTON, D. C.—The following bids were received by the Constructing Quartermaster, U. S. Army, Washington, D. C., on Aug. 15, for 1,100 lin. ft. of 4-way electric conduit with necessary manholes, etc., at the Walter Reed Army General Hospital, D. C.: R. J. Bell Construction Co., Washington, D. C., 4-way conduits, 76 cts. per ft.; 2-way conduits, 44 cts. per ft.; manholes, $22.50, $25.50 and $60 each; installing pipe, 30 cts per lin. ft. The Carroll Electric Co., Baltimore, Md., primary cable, 30 cts. per ft.; double conductor cable, 40 cts. per ft.; secondary cable, 25 cts. per ft.

FREDERICKSBURG, VA.—Cecil L. Smith, Res. Engr., Fredericksburg, writes us that the Fredericksburg Power Co. owns a wooden dam across the Rappahannock River at this point and at present is selling water for power purposes. The dam which is being constructed is to take the place of the present one, which is in bad repair. It is to be 800 ft. long, about 22 ft. high, of reinforced concrete, and is to cost about $45,000. The company owns all of the water power on the Rappahannock and Rapidan rivers within 35 miles of this point, and it is its object to develop all of this power and transmit it to this and other points if a market cannot be found for all of it here. The present dam is one of the three which is to be constructed. This, with the present canal, will develop approximately 8,000 HP. For a number of years the company has been selling water and it proposes to continue this for the present and therefore will not construct a power house in the near future. William C. Whitner is Ch. Engr. Noted on Aug. 13.

COLUMBIA, S. C.—The Central Carolina Power Co. is reported to be planning immediate construction of an electrical plant. The company contemplates construction of a dam 30 ft. high, forming, with power-house, a concrete structure, 1,400 ft. long. The power-house installation is to include six hydro-electric units, each consisting of four 48-in. turbine wheels mounted on a single shaft, direct connected to 2,000-KW. generator. The company's development is at Turkett Shoals, on Broad River, 15 miles above Columbia, and is to transmit 15,000 HP. by electricity to Columbia, Newberry and Winnsboro. According to the Manufacturers' Record, the date for opening construction and machinery bids will be decided later and developments will cost $1,850,000. Viele, Blackwell & Buck, 49 Wall St., New York, and Pressey & Weller, Hibbs Bldg., Washington, D. C., are Engrs. H. L. Milner, of Washington, D. C., is Pres. of Central Carolina Power Co.

ATLANTA, GA.—Bids are asked until 10 a. m., Sept. 9, by R. V. La Dow, Supt. of Prisons and Prisoners, Dept. of Justice, Washington, D. C., for furnishing and delivering at the U. S. Penitentiary, Atlanta, Ga., one 25-HP. electric motor and material.

ALBERTVILLE, ALA.—The Sand Mountain Electric Co. contemplates installing an electric plant and erecting 3½ miles of transmission lines to furnish electricity for lighting the town of Albertville. The company is in the market for new or second-hand equipment for an electric plant, including a 75-KW., 3-phase, 60-cycle belted alternator and accessories.

MANSFIELD, OHIO.—Bids will be received by George H. Weidner, Audr. Richland County, until noon, Sept. 10, for constructing a power-house, conduits for steam pipe and installation of heating plant in court-house and boilers and steam pump in power-house. Vernon Redding is Arch.

LOGANSPORT, IND.—Plans have been completed and bids will soon be in order for the installation of a new electric light plant in this city.

LAFAYETTE, IND.—The Indiana Lighting Co., Samuel T. Murdock, of this city, Gen. Mgr., has been incorporated with a capital of $4,500,000. The company will ask for bids soon for the construction of a number of gas producing stations.

DETROIT, MICH.—Work will be started probably during the next month, on the construction of a $2,000,000 light and power plant in Delray to duplicate the Detroit Edison Co.'s present plant west of Fort Wayne, and to be an addition to it. Bonds aggregating $7,000,000 have been sold by the company and it is said that part of the remainder of the $5,000,000 will be expended in developing power plants on the Huron River between Ypsilanti and Ann Arbor. Alexander Dow, Detroit, is Gen. Mgr.

ROYALTON, MINN.—The Royalton Power & Light Co., recently incorporated with a capital stock of $10,000, has purchased the water power on the Platte River and will erect a lighting plant, which it is expected will be completed and ready for operation by Nov. 1. Oscar Claussen, German-American Bank Bldg., St. Paul, Minn., has been engaged as engineer and is drawing plans and specifications for the plant. The officers of the company are A. C. Wilson, Pres.; Mark Murphy, Vice-Pres.; Charles R. Rhoda, Sec.-Treas.

JOLIET, MONT.—We are advised by N. S. Poole, Engr., Townsend, Mont., that a company has been incorporated and will be known as the Joliet Water & Electric Co., to furnish Joliet with water and electric light, according to a franchise granted to A. F. McCune for 25 years; also to supply power to the Joliet Flour Mills; 200 HP. will be generated by taking 1,600 ins. of water from Rock Creek by means of a 36-in. pipe for a distance of one mile, having 68 ft. fall. The water system will be a gravity system. Chas. Natman, of Bozeman, Mont., is Atty.

BEARCREEK, MONT.—We are officially advised that Yager Bros., of Billings, Mont., are contemplating the installation of water and light systems. The former will be a gravity system. For the latter a power plant will be built at Bearcreek Coal Mines. N. S. Poole, Townsend, Mont., is Engr.

SENECA, KAN.—Plans are being considered to install an engine, dynamo and switchboard in the municipal electric light plant, and to change the primary voltage to 2,200. The transmission lines will be overhauled. G. D. Myers is Mgr.

CARTHAGE.—The Empire Electric Power & Supply Co., R. J. Chaflin, Secy., has purchased and will develop water-power properties near Carthage. It will construct a 3-phase transmission line to supply electricity and install water-wheels and alternators.

BATESVILLE, ARK.—Plans are being considered by J. L. Woodfill and A. Webber to develop water power to Lock and Dam No. 1, about one mile from Bates[illegible]le, where a minimum of 5,000 HP. and [illegible] maximum of 10,000 HP. can be secured. [illegible] power will be used to generate electric[illegible] which will be distributed in Batesville [illegible] adjacent towns. It is proposed to or[illegible]ze a company under the name of th[illegible]hite River Power Co. to operate the pla[illegible]

VICTORIA, TEX.—A gas [illegible]nt is to be erected at Victoria by L[illegible] & Rogers, of Mexico, Mo. The cost of [illegible] plant will be about $75,000. The chart[illegible]ovides for a continuance of 25 years, [illegible] that the grantees shall begin active op[illegible]ons within a period of six months. It [illegible]roposed to begin the erection of the pl[illegible] within the next 60 days. Estimates are [illegible] made by local contractors for a conc[illegible] structure with iron roof, and fireproof [illegible]ughout.

TACOMA, WASH.—The Fi[illegible]nd Water Committee has recommended [illegible] the City Council that the plans drawn [illegible] a sub-station to house the electrical ap[illegible]us of the city, now stored at the plant [illegible]e Seattle-Tacoma Power Co., be changed [illegible] accommodate the present needs of the [illegible], and that the Commissioner of Public [illegible]ks be instructed to call for bids for [illegible]nstruction after the plans have been appr[illegible] by Frank L. Davis, City Engr.

NEVADA CITY, CAL.—It is [illegible]orted that William B. Bourn contemplat[illegible] building a dam on the Yuba River and [illegible] raise the present dam at Bowman to 6[illegible]

LOS ANGELES, CAL.—Bids [illegible] asked by the Board of Public Works un[illegible] 11 a. m., Aug. 31, for furnishing the city necessary hydraulic and electrical machinery and apparatus and line material, to equip a hydro-electric generating plant of 600-KW. capacity, and about 50 miles of 30,000-volt transmission line. Horace B. Ferris is Secy.

TORONTO, ONT.—The contract for building the Hydro-Electric Commission's transmission line has been awarded to the F. H. McGUIGAN CONSTRUCTION CO. The contract calls for 293 miles, costing $1,270,000. The Commission has the option to withdraw 58 miles of this work or add another 293 miles, providing this is arranged before Feb. 1909. The cost per mile is figured in four ways: (1) Double circuit towers, double line, $5,240; (2) single circuit towers, double line, $4,830; (3) double circuit towers, single line, $4,080; (4) single circuit towers, single line, $3,570. The aluminum for cable and pig, will be manufactured by the NORTHERN ALUMINUM CO. OF AMERICA, at Shawingan Falls, Que. The steel towers will be manufactured by the CANADA BRIDGE CO., of Walkerville, Ont., and by the ONTARIO IRON & STEEL CO., of Welland, Ont. The line is to be completed within 15 months from date.

The Hydro-Electric Power Commission will call for bids soon for transforming stations. The specifications are nearly ready. The F. H. McGuigan Construction Co. will not bid for this work, as it requires electrical equipment. There will be twelve stations which will be built at the following points: Niagara Falls, Dundas (combined transformer and inter-switching), Toronto, Brantford, Woodstock, London, Guelph, Preston (supplying Galt and Hespeler), Berlin (supplying Waterloo and New Hamburg), Stratford, St. Mary's, and St. Thomas. The Stratford and St. Mary's stations are dependent upon the Stratford by-law.

SAULT STE. MARIE, ONT.—Plans are being considered for the reconstruction of the power plant of the Togona Water & Light Co., which was destroyed by fire in May. J. S. Wynn is Acting Mgr.

PORT ARTHUR, ONT.—Bids will be received by the City Clerk until Aug. 29, for the construction of a concrete dam on Onion Lake, on Current River. Following are approximate quantities of the various classes of material which will enter into the work: Earth excavation, 100 cu. yds.; rock excavation, 450 cu. yds.; concrete, 1:3:5, 2,000 cu. yds.; concrete, 1:2:4, 100 cu. yds.; reinforcing steel, 3,000 lbs.; c.-i. in place, 1,500 lbs. Plans and specifications, instructions to bidders and form of contract can be seen at the office of J. Antonisen, City Engr., Port Arthur, and at the office of Smith, Kerry & Chase, Toronto. J. McTeigue is City Clerk, Port Arthur.

CHAUDIERE MILLS, QUE.—The contract for the construction of the dam here to increase the water-power has been awarded to QUINLAN & ROBERTSON, of Montreal, Que. Price, $250,000.

WINNIPEG, MAN.—Bids are asked by the City of Winnipeg until Aug. 31 for the supply of 50,000 carbons for arc lamps. Magnus Petersoi is Secy. Bd. of Control.

EDMONTON, ALTA.—The contracts for grading from Ninth St. to the river have been let to J. L. EAGLE at 22 cts. per cu. yd.; for erecting poles, to OSCAR BARNSTEAD, for $4,450; for electric generators, to the CANADIAN WESTINGHOUSE CO., Sovereign Bank Bldg., Montreal, Que.; for motor generators, to the CANADIAN GENERAL ELECTRIC CO., 81 St. Peters St., Montreal; for rails, copper, wire, bolts, plates, etc., to GORMAN, CLANCEY & GRINDLEY, of Edmonton.

CALGARY, ALTA.—ALLIS-CHALMERS-BULLOCK, LTD., Sovereign Bank Bldg., Montreal, have secured the contract to enlarge the municipal lighting plant, with a 750-KW. alternating current generator, 30-KW. excitor, switchboard and other auxiliary apparatus.

GUADALAJARA, MEXICO.—The Atotonilco Light & Power Co. has been organized in this city with a capital of $50,000 to install a hydro-electric plant and furnish light and power to the town of Atotonilco and to haciendas and industrial plants in the tributary territory. Atotonilco is the center of the orange district of Jalisco. The officers of the new company are Enrique Alvarez de Castillo, Pres.; Francisco Muñoz, Vice-Pres.; Alfredo Gonzales, Secy.; José M. Corvera, Treas., and Alfredo Gallardo, Gen. Mgr. The other stockholders are Manuel Cuesta Gallardo, Dr. Felipe Valencia, Carlos Hering, Vincente Orendain, Fred'k

M. Newton Jose C. Diegues and Dr. Carlos Barriere ... the generation of electric current the ... company will use the Faretan waterfall ... the town of Atotonilco. The water d... distance of 75 ft., and power sufficient ... all needs in that section can be deve...

BRIDGES.

(d... that this work is advertised in Engineering News.)*

PORT...UTH, N. H.—The Boston & Maine R. R. Co. will construct a steel bridge ...s the Piscataqua River in the fall. ...ate cost, $350,000. H. Bissell is Ch. E... Boston, Mass.

*AM...DAM, N. Y.—Bids are asked by the ci... until Sept. 15, for the construction of a ... steel bridge, 465 ft. long, across the S...rie Creek between the towns of Florid... and Glen in the County of Montgomery, New York, bids to include all labor and m...ials necessary for making surveys, boring...and designs for the abutments, pier and ap...oaches and the construction of the pier and abutments. Specifications for substructure and contract may be seen at the office of W. Barlow Dunlap, Amsterdam, N. Y.

CARMICHAELS, PA.—The contract for the abutments for the Montgomery bridge near here has been awarded to YODERS BROS., of Waynesburg, Pa., and for the abutments for the Muddy Creek Bridge, below this place, at $2.90 per perch and $2.28 per perch respectively. The contract for the superstructure has not been awarded.

HARRISBURG, PA.—Bids are asked until noon, Aug. 29, by W. W. Caldwell, Comr. of Highways, for constructing reinforced concrete bridge for the city.

YORK, PA.—Bids are asked by the County Commissioners until 1 p. m., Sept. 2, for the erection of the substructure and superstructure of a county bridge over the west branch of the Codorus Creek, near Porter's siding. The substructure is to consist of two stone abutments each 19 ft. long at base, 17 ft. at top, 4-ft. thick at base, 3-ft. thick at top, to be built from solid foundations to a height on a level with that of the abutments of the Western Maryland railroad bridge at the same plant, the abutments to be joined with the abutments of the railroad bridge; two wing walls, one 25 ft., the other 23 ft. long, bids to be submitted per cu. yd. of masonry. Superstructure is to be a steel bridge extreme length 84 ft., 14-ft. roadway in the clear, capacity 1,750 lbs. per lin. ft. floor system for 12 tons road roller. Plans and specifications may be seen at the office of the County Commissioners. C. B. King is Clk.

WORMLEYSBURG, PA.—The contract for the construction of a bridge on the State highway between Wormleysburg and West Fairview has been awarded to HIMES & HATFIELD, of West Fairview.

*MONONGAHELA, PA.—Bids are asked by F. P. Booth, County Controller, Pittsburg, and by the County Commissioners of Washington County, until noon, Sept. 10, for the erection of a joint county bridge over the Monongahela River here. The bridge will have three 455-ft. spans carried on two concrete abutments and two stone river piers with pile and concrete foundations.

HAVRE DE GRACE, MD.—The Havre de Grace & Perryville Bridge Co. is endeavoring to complete arrangements for reconstructing the Philadelphia, Washington & Baltimore railway bridge into a highway bridge. Estimated cost, $70,000. Secretary of War has not as yet given his approval of the company's plans.

EUREKA MILLS, VA.—The ROANOKE BRIDGE CO., Roanoke, Va., has been awarded the contract at $4,000 for constructing four steel bridges for the county.

OCALA, FLA.—Bids are asked by the Board of County Commissioners, Ocala, until Sept. 9 for the construction of steel bridges across the Ocklawaha River at Sharp's Ferry and at Moss Bluff Ferry. Plans and specifications can be obtained at the office of Austin Bros., Archs., Atlanta, Ga., or from S. T. Sistrunk, Clk. of Circuit Court, Ocala.

MONTGOMERY, ALA.—The city has decided to construct a reinforced concrete bridge over the Central of Georgia Ry. tracks at Madison St.

COLUMBUS, MISS.—Bids are asked by the Board of Supervisors until Sept. 7, for the construction of two concrete bridges. D. D. Richards is Clk. Bd.

DEFIANCE, OHIO.—The City Engineer is preparing plans for the construction of a lift bridge to be erected over the canal at Fifth St.

CLEVELAND, OHIO.—Bids are asked by P. J. O'Connell, Mgr. Calvary Cemetery, 1007 Superior Ave., N. E., until 11 a. m., Aug. 29, for a reinforced concrete bridge under the tracks of the Wheeling & Lake Erie R. R. Co. in Calvary Cemetery. The William H. Evers Engineering Co., The Arcade, Cleveland, Ohio.

ASHLAND, OHIO.—Bids are asked until noon, Sept. 10, by the County Commissioners for the construction of a bridge in Clearcreek Township; also a 50-ft. extreme steel superstructure with stone abutments, etc. E. B. Westover is County Audr.

*ROCKY RIVER, OHIO.—Schillinger Bros., 1181 N. Seeley Ave., Chicago, Ill., submitted the lowest bid to the County Commissioners on Aug. 24 for the construction of a concrete bridge over Rocky River, at $208,299, about $45,000 under the engineer's estimate. Other bidders were: The New York Continental-Jewell Filtration Co., of New York, $236,836; E. M. Graves, of Cleveland, Ohio, $244,655; Carey Construction Co., of Cleveland, $247,331; Hunkin Bros., of Cleveland, $247,678; C. H. Fath & Son Construction Co., of Cleveland, $249,829; Beers & Doolittle, of Cleveland, $251,208; Westwater & Casey, of Columbus, Ohio, $252,981; M. Wardell, of Elyria, Ohio, $256,516; J. D. Tuttle, of Cleveland, $261,655; Baltimore Ferro-Construction Co., of Baltimore, $266,984; Baltimore Ferro-Concrete Construction Co., of Cincinnati, Ohio, $270,837.

INDIANAPOLIS, IND.—The County Commissioners have appropriated $100,000 for the construction of a bridge over Fall Creek at Capital Ave.; $20,000 for a bridge at Iowa and Ringold Sts.; $12,000 for a bridge in Washington Township; $16,000 for a bridge over Williams Creek; $8,000 for a bridge over Lick Creek, Perry Township; $8,000 for a bridge over Pleasant Run on county line; $7,500 for a bridge over Fall Creek on county line; $10,000 for a bridge over Eagle Creek on the McCurdy Pike; $25,000 for a bridge over Little Eagle Creek, Warren Township; and $48,000 for bridges and culverts on township roads.

VALPARAISO, IND.—Bids are asked until Sept. 7, by S. P. Corboy, County Audr., for constructing two bridges in Jackson Township.

AURORA, ILL.—Bids were received as follows by the Council Road and Bridge Commission for the construction of the Fox St. bridges: Roemhild Construction Co., Chicago, Ill., east bridge $35,882, west bridge $31,733; J. A. Meinneman, Chicago, Ill., east bridge $40,500, west bridge $36,400; J. O. Heyworth, east bridge $50,890, west bridge $40,490; Yale & Reagan, Aurora, Ill., east bridge $61,000, west bridge $47,000; J. J. O'Herron, east bridge $42,900, west bridge $42,900.

FORT ATKINSON, WIS.—The citizens have voted the sum of $12,000 for a new bridge at the southern terminus of Roberts St. and for repairs to the Main St. bridge.

MILAN, MO.—The Milan Bridge Co. has been incorporated with $10,000 capital stock by J. A. Young, A. L. Brown, Charles H. Morris and others.

MARYVILLE, MO.—Nodaway County has voted $75,000 of bonds for the repair of bridges.

SNYDER, TEX.—Scurry County has voted the sum of $70,000 for bridges and roads.

GRANBURY, TEX.—Hood County has voted $20,000 of bonds to replace the bridges destroyed by storm.

VERNON, TEX.—MITCHELL & PIGG, of Vernon, have been awarded the contract for constructing a wagon bridge across the Pease River at $23,500.

BEAVER, OKLA.—Bids are asked until Sept. 7, by W. L. Beardsley, County Clk., for constructing a wood, pile bridge over the Beaver River.

WALLA WALLA, WASH.—Walla Walla County has decided to construct a new bridge over Mill Creek at what is known as Kennedy Crossing. The bridge will be about 150 ft. long.

PORTLAND, ORE.—See under Miscellaneous Contracts—"Municipal Improvements."

EMPIRE, CAL.—The proposition of the National Bridge Co. to draw up plans and specifications for the new bridge across the Tuolumne River at Empire was accepted by the Board of Supervisors on Aug. 10. The proposition of the company is to draw up all plans and specifications for the structure and submit them to the board. If they are accepted, the company awarded the contract for the construction of the bridge will pay for the plans.

SALINAS, CAL.—Bids are asked until 2 p. m., Sept. 8, by T. P. Joy, Clk. County Supervisors, for the extension and repairs of the Hilltown bridge jetties on the Salinas River. Lou G. Hare is County Surv., Salinas.

GRAND FALLS, N. B.—The Grand Trunk Pacific Ry. Co. will construct a viaduct across the Salmon River at cost of $500,000. This will be one of the heaviest structures on the system.

BUILDINGS.

(denotes that this work is advertised in Engineering News.)*

BOSTON, MASS.—Bids are asked until 11 a. m., Sept. 14, by the Quartermaster, U. S. Marine Corps, Washington, D. C., for the completion of the Marine Barracks, Navy Yard, Boston. Bruce, Price & de Sibour, 527 Fifth Ave., New York, are Archs.

Shepley, Rutan & Coolidge, Archs., Ames Bldg., Boston, have plans for a 10-story bank and office building for the Boston Safe Deposit & Trust Co., to cost $500,000.

LYNN, MASS.—We are officially advised that the proposed West Lynn grammar school will be built at a cost of $75,000. Bids will be called for within two weeks by Charles H. Spear, Clerk of Comrs. Joseph W. Attwell is City Clerk.

HARTFORD, CONN.—Bids are asked Aug. 31, by the State Library and Supreme Court Building Commission, Hon. Morgan G. Bulkeley, of Hartford, Chn., and L. W. Robinson, New Haven, Secy., for construction of proposed library building at Hartford. The Commission has accepted the plans of Donn Barber, 24 East 23d St., New York, and E. T. Hapgood, Hartford, Associate Archs., for the proposed building, which is to cost approximately $1,000,000.

FORT SLOCUM (New Rochelle post-office), N. Y.—Bids are asked by the Constructing Quartermaster, Ft. Slocum, until 11 a. m., Sept. 3, for construction, plumbing, steam heating and electric wiring additions to post hospital.

NEW YORK, N. Y.—The following bids were received by C. B. J. Snyder, Supt. School Bldgs., on Aug. 19, for (1) fire protection, etc., at Public School No. 16, Wilson, near Bedford Ave., and Public School No. 35, Decatur St., near Lewis Ave., Boro. of Brooklyn, and (2) fire protection, etc., at Public School No. 75: Joseph Ryan, 43 Halsey St., Astoria, (1) $11,500, (1a) $5,027, (2) $21,750. Clarke & Stowe, 221 Greenpoint Ave., Brooklyn, (1) $14,300, (1a) $7,900, (2) $23,900. William Werner, 892 Forest Ave., (1) $14,950, (1a) $8,250, (2) $22,975. Thomas McKeown, 521 West 110th St., (2) $25,000.

We are officially advised that the TURNER CONSTRUCTION CO., 11 Broadway, has been awarded the general contract for the construction of a reinforced concrete warehouse one story high, 90 × 100 ft. in plan, for the Hardy-Voorhees Co., Richard A. Wright, Engr., at Metropolitan Ave., near Newtown Creek, Brooklyn. This building will have 30-ft. clear spans.

A 3-story and basement fire station house is to be built for a hook and ladder company on Hancock Pl., west of Manhattan Ave. It will have a frontage of 28 ft. and a depth of 75 ft., with a facade of ornamental limestone lighted by large mullion bays. It will cost $40,000. Howard Constable, 14 East 23d St., is Arch.; Nicholas J. Hayes is Fire Comr.

NEW YORK, N. Y.—Bids were received as follows, Aug. 20, at the office of Col. F. L. Denny, Q. M., Marine Corps, Washington, D. C., for the construction of a storehouse at the Marine Barracks, Navy Yard, New York: Jacob & Youngs, 1133 Broadway, New York, $39,330; C. F. Bond Co., 136 Liberty St., New York, $34,581; Henry McNally, New York, $36,082; Jacob Fels, Brooklyn, N. Y., $48,200; Northeastern Construction Co., New York, $39,880; Fred C. Collins, New York, $65,474; Christopher Campbell, 10 East 33d St., New York, $41,941; H. D. Best & Co., 1170 Broadway, New York, $36,342; Joseph G. Acker, New York, $37,600; O'Connell & Hanna, 271 West 125th St., New York, $30,990; Keystone Construction Co., New York, $34,000; Richard Deeves & Sons, New York, $36,485; John Thacher & Sons, Brooklyn, $41,000; William A. Luth & Co., Brooklyn, $35,230; Westinghouse, Church, Kerr & Co., New York, $39,927; Kelley & Kelley, Inc., New York, $47,635; Daniel J. Ryan, Brooklyn, $39,900; George Hildebrand, New York, $38,450; George Vassar Son & Co., New York, $37,131; William F. Holding, New York, $35,800; J. F. Walsh & Bro., New York, $37,870.

Moore & Landseidel, Archs., Third Ave. and 148th St., advise us that estimates will be taken about Sept. 1 for erecting a 6-story brick and stone apartment house, 75 × 90 and 87 ft., to be erected at Wadsworth Ave. and 180th St. The structure will cost $100,000 and will be owned by Elias Gussarafi, 600 West 142d St.

Plans have been filed with the Buildings Superintendent for a 6-story commercial building to be erected at 11 West 34th St. for the Eleven West Thirty-fourth Street Co., F. A. Harris, Pres. It will have a frontage of 25 ft. and a depth of 113.11 ft., with an extension, the facade being of terra cotta, trimmed brick, ornamented with large mullion bays. It is to cost $200,000. David M. Ach, 1 Madison Ave., is Arch.

NEW YORK, N. Y.—John Hauser, Arch., 360 West 125th St., advises us that the South Side Construction Co., 123 West 179th St., has let steel contract for two five-story apartment houses to WILLIAM HAUPTMANN, 10 East 104th St. The building will be erected on 178th St., east of Audubon Ave., and will cost, together, $86,000.

Work will be started at once on the proposed extension to the Whitehall Building, Battery Pl. As noted on April 9: "We are officially advised that the Century Investment and the Battery Place Realty Companies will erect a 36-story office building on the premises at 4 to 14 West St., 6 to 18 Washington St., and 17 Battery Pl., from plans by Clinton & Russell, Archs., 32 Nassau St. It will cost $4,600,000. It will adjoin the Whitehall Building, also owned by the above companies, and which is 22 stories high. The proposed structure will be connected with the Whitehall Building by a court. It will front 206.3 ft. on West St. and 270.5 ft. on Washington St. The design will be of renaissance type of brick, with trimmings of granite and terra cotta. There will be a central tower structure, 95½ × 94.3 ft., rising to a height of 36 stories, or 446.9 ft., and flanked by east and west wings, facing respectively on West and on Washington Sts. The east wing will be 16 stories and the west wing 31 stories high. The tower will have a low peaked dome, with an ornamental balustrade, with an arch in the middle of the span. The building will be equipped with 30 elevators, four of which will be continuous express to the 36th story, seven express to the 30th story and the remainder will be for service to the 16th floor. Wm. H. Cheseborough, 111 Broadway, is Pres. of the companies interested."

We are officially advised that B. Crystal, 21 West 34th St., is taking estimates for a 6-story brick and stone tenement building, 99.11 × 140 ft., to be erected at Broadway and 151st St. Neville & Bagge, 217 West 125th St., are Archs.

NEW YORK, N. Y.—Bids are asked by the Board of Health, Dr. Thomas Darlington, Pres., until 9.45 a. m., Sept. 8, for furnishing and delivering timber, lumber, moulding, etc., to the Tuberculosis Sanatorium at Otisville, Orange County, New York, during the year 1908.

We are advised by Townsend, Steinle & Haskell, Archs., Broadway and 34th St., that estimates will be taken about Sept. 1 for constructing an 11-story brick and stone loft building, 84.1 × 138.3 ft., at Broadway and 31st St. The building will cost $350,000, and will be erected for William R. H. Martin, Greenwich, Conn.

Plans have been filed for a 6-story apartment house at the corner of New Ave. and 181st St., to be built for the Pinehurst Realty Co. at a cost of $170,000. It will have an avenue frontage of 128.9 ft. and a depth of 93.8 ft., with facades of brick, finished with Indiana limestone, and will contain thirty suites of apartments. G. F. Pelham, 503 Fifth Ave., is Arch.

NEW YORK, N. Y.—The following bids were received on Aug. 20 by the Park Board, Henry Smith, Pres., for work and material for the execution of the approach work exterior to the building of the New York Public Library, Astor, Lenox and Tilden Foundations, Fifth Ave., 40th and 42d Sts.: Luke A. Burke & Sons, 25 West 42d St., $670,000; Gurdon & Gilardi, 1 Madison Ave., $687,400; Bart Dunn, 444 East 66th St., $785,400; John H. Parker Co., 1 Madison Ave., $735,600; Snare & Triest, 143 Liberty St., $668,200; John C. Robinson & Son, 40 West 34th St., $587,323; John Gill & Son, $677,138; John Pierce & Co., 277 Broadway, $629,000; Kelly & Kelley, Inc., 45 East 42d St., $697,341; Richard E. Henningham, 1 Madison Ave., $644,800; Fountain & Choate, 1123 Broadway, $710,000; Charles A. Peckworth, 415 Hudson St., $669,878; John F. Walsh & Bro., 137 Charlton St., $659,771; Norcross Bros., 156 Fifth Ave., $523,000; McHarg-Barton & Co., 165 Broadway, $563,000. Carrere & Hastings, 225 Fifth Ave., are Archs.

NEW YORK, N. Y.—The following bids were received on Aug. 24 by Robert W. Hebberd, Comr. of Public Charities, for furnishing all the labor and materials required for the erection and completion of Nurses' Home and Training School, Kings County Hospital, Boro. of Brooklyn: Guidone & Gelardi, 1 Madison Ave., $256,500; John H. Parker, 225 Fourth Ave., $257,895; Peter Cleary, 430 East 57th St., $244,880; Ormond & O'Brien, President St., Brooklyn, $252,900; P. J. Brennan & Son, 759 East 73d St., $253,800; C. J. Ryan, 723 Third Ave., Brooklyn, $256,700; Fountain & Choate, 110 East 23d St., $258,000; J. F. Walsh & Bro., 351 Park Ave., $240,951; Richard E. Henningham, 1 Madison Ave., $249,663; Wilmarth Building Co., 1 Madison Ave., $248,789; P. J. Carlin Construction Co., Kent Ave., Brooklyn, $258,700; Kelly & Kelley, Inc., 45 East 42d St., $255,223; F. T. Nesbit, 116 Nassau St., $259,000; Peter Guthy, 924 Broadway, Brooklyn, $264,993; Clarke & Stowe, 221 Greenpoint Ave., Brooklyn, $263,000; O'Connell & Hanna, 271 West 125th St., $253,500.

BATAVIA, N. Y.—Bids are asked until noon, Sept. 4, by William G. Pollard, Secy. Masonic Temple Association, for the construction of the Masonic Temple Building to be erected at the corner of Main and Center Sts. Robert R. North, 1326 Prudential Bldg., Buffalo, is Arch. The estimated cost is $40,000.

COOPERSTOWN, N. Y.—TUTTLE & ROOT have been awarded contract for the summer hotel to overlook Otsego Lake for Edward Severin and Stephen Carlton Clark, from designs of Perry C. Griffin, 244 Fifth Ave., New York. The building will be 256 ft. long and 146½ ft. wide, five stories in height, with an extension kitchen 57 ft. wide and 96 ft. in length, and will cost $200,000.

BUFFALO, N. Y.—We are officially advised that Edward H. Greiner, 548 Ellicott Sq., representing the Greiner Estate, will build a 4-story and basement brick business block, 50 × 200 ft., on Main St., extending through to Washington St., north of Chippewa St. The general contract has been let to E. M. HAGER & SONS CO., 141 Elm St. Bethune, Bethune & Fuchs, 215 Franklin St., are Archs.

SCHENECTADY, N. Y.—The Committee of the College Trustees of Union College at their last meeting decided to locate the proposed General or Civil Engineering Building on the plot of ground between the Kappa Alpha House and the North College, facing North College Lane. The building is to cost $100,000, that sum having been donated by Andrew Carnegie, the other $100,000 having been raised by graduates to secure the Carnegie gift and will be added to the general endowment fund of the college. The new building is to be three stories in height and will be 136 × 66 ft. It will be built so that an extension may be added at any time in the rear. The plans and specifications are now being prepared by Fuller & Pitcher, Archs., 95 State St., Albany, N. Y., and bids for the work will be asked for soon. The building must be ready for occupancy at the beginning of the college year in 1909.

SECAUCUS, N. J.—William T. Towner, New York, has completed plans for a 3-story school building, 65 × 90 ft., for the Board of Education, Secaucus, Cost, $60,000.

PRINCETON, N. J.—We are officially advised that Frank Miles Day & Bro., Archs., 925 Chestnut St., Philadelphia, Pa., are preparing plans for a 3-story dormitory building for the University of Princeton, Princeton. The building will cost $250,000.

*FORT HANCOCK, N. J.—Bids are asked by Capt. M. N. Falls, Constr. Q. M., until 2 p. m., Sept. 23, for constructing plumbing, heating and electric wiring one double set of N. C. O. quarters and two double sets of Firemen's quarters at Fort Hancock, N. J.

RAHWAY, N. J.—We are officially advised that the City Council will erect a school to cost about $60,000. Charles Lambert is City Clerk.

TRENTON, N. J.—The lowest estimate on the cost of the proposed City Hall for Trenton, N. J., of the 19 bids received on Aug. 25, was made by the Charles McCaul Co., Tenth and Sansom Sts., Philadelphia, Pa. Its bid was, for granite alone, $443,113, and for marble and granite, $439,995. The following bids were submitted by other Philadelphia contractors: James G. Doak & Co., for granite, $449,000; for granite and marble, $447,000; George A. Glenn & Co., for granite, $468,500, for marble and granite, $444,500; Lynch Bros., for granite, $460,336, for marble and granite, $458,336; William Steel & Sons Co., for granite $494,364, for granite and marble, $494,364; Cramp & Co., for granite, $455,678, for marble and granite, $458,509. Spencer Roberts, Weightman Bldg., Philadelphia, is Arch.

PHILADELPHIA, PA.—The Kensington Trust Co., 2638 Kensington Ave., has purchased a lot 80 × 115 ft. on Kensington Ave., north of Allegheny Ave., on which the company will build a bank building to cost about $100,000. Estimates will be asked on plans for the new building within the next two weeks. Work on the building will be begun early in the fall.

GREENSBURG, PA.—The contract for erection of the United Brethren Church here has been awarded to J. LUTHER LONG, of Wilkinsburg, Pa., at $57,500. This price does not include the art glass, interior decoration, plumbing, heating or electrical wir-

ing and fixtures. The total cost of the structure will be about $90,000. The exterior will be limestone.

SHAMOKIN, PA.—Jury & Kessler, Archs., Shamokin, have completed plans for a market house to be erected by F. P. Llewellyn and sisters at the corner of Independence and Anthracite Sts. It is expected that work will be commenced on the structure soon. When completed the building will cost $40,000.

PITTSBURG, PA.—Bids were received as follows Aug. 20, at the office of James Knox Taylor, Superv. Arch., Treasury Dept., Washington, D. C., for the construction of a Marine Hospital building at Pittsburg, Pa.: W. W. Luyster, Dayton, Ohio, $94,344; F. T. Nesbit & Co., Inc., New York, $98,000; Durolithic Co., 460 Ellicott Sq., Buffalo, N. Y., $87,113; John G. Unkefer & Co., Minerva, Ohio, $100,624; Henry Shenk Co., Pittsburg, $88,388; William Miller & Sons Co., Pittsburg, Pa., $92,104; A. & S. Wilson Co., Pittsburg, $94,374; William F. Holding, New York, $94,300; Barnes Bros., Hamilton, Ohio, $109,000 King Lumber Co., Charlottesville, Va., $98,989; M. P. Wells, Philadelphia, $96,197.

We are advised by Thomas Hannah, Arch., Diamond Bank Bldg., Pittsburg, that bids are being received for general contract, heating and ventilating, plumbing, electric wiring and steel work, etc., for the proposed East Liberty Y. M. C. A. building. The building will have five stories and will be 90 × 131 ft. It will be fireproof and of brick, stone and terra cotta. Cost, $250,000.

PITTSBURG, PA.—The general contract for the office building to be built on West Ohio St., North Side, for the Benj. Frankling Insurance Co., has been awarded to GEORGE A. COCHRAN, 1210 Washington Ave., North Side. The building will cost $90,000, will be 3½ stories in height, 40 × 120 ft., and will be of white polished granite. The general contract does not include elevators, plumbing, heating or electric work.

*BALTIMORE, MD.—Bids are asked until 3 p. m., Sept. 24, by James Knox Taylor, Superv. Arch., Treasury Dept., for the plumbing system, etc., in the extension to the U. S. court-house and post-office building at Baltimore.

BALTIMORE, MD.—E. A. Blackshere, Union Stock Yards, has had plans prepared by and has awarded contract to JAMES B. YEATMAN, 4742 Park Heights Ave., Baltimore, for erection of 30 dwellings—13 on Linden Ave., 13 on Bolton Ave. and four on Ducatel St. They will have three stories, tin or slag roofs, hot water heat. Corner houses will be 17 × 62½ ft.; the others, 15½ × 62½ ft. Aggregate cost, $144,000.

Johns Hopkins Hospital Trust Estate, John C. Thomas, Treas., Calvert Bldg., has had plans prepared by Archer & Allen, 47-48 Central Savings Bank Bldg., corner Charles and Lexington Sts., Baltimore, for proposed warehouse at Pratt and Commerce Sts. It will have six stories, 56 × 97 ft., and will be of reinforced concrete construction. Area of each floor, 5,432 sq. ft. Cost, about $60,000. Contract has been awarded to BALTIMORE FERRO-CONCRETE CO., 16 St. Paul St., Baltimore.

WASHINGTON, D. C.—Elliot Woods, Supt. of the U. S. Capitol Building and Grounds, Washington, D. C., has awarded contract for furnishing the bronze elevator enclosures for the Senate Office Building to the CHICAGO ORNAMENTAL IRON CO., 37th and Stewart Ave., Chicago, at $45,793. A complete list of bids was given last week.

Bids are asked by Brig. Gen. Crosby P. Miller, U. S. A., retired, until 2 p. m., Sept. 11, for ornamental iron work, miscellaneous iron work and light metal work at the mess hall and dormitory building, U. S. Soldiers' Home, Washington.

John O. Evans, Mgr. of the Evans Estate, The Burlington, will erect a bank and office building on the south side of New York Ave., between 14th and 15th Sts. It will be nine stories, 90 × 80 ft., fireproof construction. Cost, $200,000. Frederick B. Pyle, 1003 F St., N. W., Washington, is Arch.

PETERSBURG, VA.—Bids were received as follows on Aug. 19 at the office of James Knox Taylor, Superv. Arch., Treasury Dept., Washington, for the construction of an extension to the post-office building at Petersburg, Va.: E. Hart, Norfolk, Va., $61,000; W. M. Seay & Son, Lynchburg, Va., $58,775; King Lumber Co., Charlottesville, Va., $63,384; G. B. Keeler & Sons, Petersburg, Va., $65,850; R. H. Richardson & Son, Hampton, Va., $63,734. Time to complete, Oct. 1, 1909.

RICHMOND, VA.—Bids are asked until noon, Sept. 10, by R. K. McKee, Secy. New Bldg. Com., Richmond, for erecting a Y. M. C. A. building here. Seymore Davis & Paul A. Davis, 3d, and W. C. West, 1600 Chestnut St., Philadelphia, Pa., are Archs. Cost, complete, $350,000.

The American Terminal Warehouse Corporation, W. B. West, Pres., will expend about $60,000 in erection of a storage warehouse. It will be 100 × 100 ft.; five stories high, of reinforced concrete, with steam heat, electric lighting, electric elevator. D. I. Davis Co., Chicago, Ill., associated with Carneal & Johnson, Richmond, are Archs. Contract has been awarded to I. J. SMITH CO., of Richmond.

*WHEELING, W. VA.—Bids are asked until 11 a. m., Sept. 23, by Capt. F. W. Altstaetter, Corps Engrs., U. S. A., for building lock-keepers' houses at Dams Nos. 18 and 26, Ohio River.

BUCKHANNON, W. VA.—Bids are asked until noon, Sept. 1, by the Board of Education of the Independent School District, Roy Reger, Secy., for erection of a 14-room and an 8-room school building in this district. Alexander & Chaplin, New Martinsville, W. Va., are Archs. for the former building, and E. J. Wood, Clarksburg, W. Va., for the latter.

DURHAM, N. C.—C. C. Hook, Arch., Trust Bldg., Charlotte, is drawing plans for a $100,000 residence to be erected here by B. N. Duke.

ANDERSON, S. C.—James Knox Taylor, Superv. Arch., Treasury Dept., Washington, has rejected the bids received on Aug. 12 for construction of a post-office here. The lowest bid received was that of the King Lumber Co., Charlottesville, Va., at $37,870.

AUBURN, ALA.—The Alabama Polytechnic Institute, Charles G. Thatch, Pres., has awarded contract to the BIRMINGHAM BUILDING & IMPROVEMENT CO., John M. Brooks, Pres., Birmingham, Ala., to erect a commercial agricultural hall, to be known as Comer Hall. Alabama red and buff brick will be used. Contract price, $57,250. SIBLEY-MINGE BRICK CO., Birmingham, Ala., has secured the contract for brick.

LOUISVILLE, KY.—A clubhouse is to be erected by the Pendennis Club, 332 West Walnut St. Estimated cost, $200,000.

McDonald & Dodd, Archs., Equitable Life Bldg., let contract to BAILEY & KOERNER for remodeling a 1-story stone church for Second Presbyterian congregation, Rev. Smith, Pastor. Cost, $60,000.

Plans are being prepared by McDonald & Dodd for a 7-story hotel building, 60 × 100 ft., for Tyler Estate, care Owen Tyler, Tyler Bldg. Cost, $150,000.

ASHTABULA, OHIO.—We are officially advised that plans have been completed by Briggs & Nelson, Rose Bldg., Cleveland, Ohio, and John Wilson, Ashtabula, Archs., for a 3-story club and gymnasium building, 50 × 170 ft., for the Y. M. C. A., Ashtabula, to cost $57,000. Contract for foundation work will be let about Sept. 15.

GARY, IND.—The Lake Shore & Michigan Southern and Baltimore & Ohio railroad companies have announced that they have accepted plans for a $250,000 union depot at Gary, basing their specifications for a city of 50,000. Samuel Rockwell, Cleveland, Ohio, is Ch. Engr., L. S. & M. S. Ry. Co.

*WASHINGTON, IND.—Bids are asked by the Commissioners of Daviess County until Sept. 9, for remodeling the county court-house. Thomas Nugent is County Audr.

INDIANAPOLIS, IND.—Plans have been ordered and as soon as completed the Board of Public Works will ask for bids for construction of a city hall to be erected at the corner of Ohio and Alabama Sts.

DETROIT, MICH.—We are officially advised that plans are being prepared by Malcomson & Higginbotham, Archs., Moffat Bldg., for a 2-story and basement addition to the Eastern High School for the Board of Education, William J. Lee, Secy. The addition will cost $100,000.

JOLIET, ILL.—Bids will be received by Julan Barnes, Arch., 153 LaSalle St., Chicago, until 4 p. m., Sept. 1, for masonry, fireproofing, roofing, sheet metal, terra cotta and carpentry for the Joliet National Bank building, at Chicago and Clinton Sts., Joliet. Plans, etc., are at the bank, 316 Chicago St., and at office of architect. T. A. Mason is Pres.

CHICAGO, ILL.—Gage Bros. & Co., wholesale milliners, 129 Michigan Ave., are planning the erection of a warehouse on the south side. The site has not been secured, but the neighborhood of Indiana Ave. and 18th St., is being considered. The building will be six stories high and will cost $200,000.

Walter & Co., 1032 Belmont Ave., have finished plans for a 1-story Baptist Sunday School building, 42 × 50 ft., to be erected at North and Kedzie Aves. It will cost $5,000. The congregation, it is reported, will in the future, erect a church to cost about $50,000.

The following bids were opened on Aug. 17 by James Knox Taylor, Superv. Arch., Treasury Dept., Washington, D. C., for painting and decorating part of the U. S. court-house at Chicago, Ill.: W. P. Nelson, 241 Michigan Ave., Chicago, Ill., $45,000, time, April , 1909; Frank D. Millet, New York, $45,000, time, eight months.

An apartment building is to be erected at 49th St. and Vincennes Ave. for Mark and Louis Aaron which is to cost $125,000. It will be three stories and will contain 32 suites.

Robert C. Berlin, Arch., Association Bldg., has let general contract to C. EVERETT CLARK CO., 100 Washington St., for a theater for W. A. Wieboldt. Cost, $150,000.

Eight apartment buildings are to be built on the east side of Clifton Park Ave., 100 ft. south of 15th St., by John E. Stellwagen & Co. The total cost will be $52,000. Each of the buildings will be two stories, 22 × 56 ft.

CHICAGO, ILL.—The County Board at its meeting on Aug. 24, awarded a contract for a tuberculosis hospital on the ground of the Cook County Hospital to J. P. & J. W. O'CONNOR, Security Bldg., Chicago, Ill., whose bid, $222,900, was lowest. Fifteen other bids were received from the following: James Shedden & Co., $237,838; John Gebhardt & Son, $241,740; Warren Construction Co., $242,575; C. Everett Clark Co., $242,841; Wells Bros., $243,731; Scoullar Contracting Co., $244,444; B. M. Zadeck Co., $244,800; D. H. Doyle, $248,453; Marrice & Barron, $249,500; O. & E. Anderson, $251,476; R. Bruce Watson, $256,400; H. Gillsdorf & Sons, $262,327; John Griffiths & Sons, $263,000; William Mavor Co., $266,750; Alling Construction Co., $268,616. The contract will be signed when the O'Connors furnish a bond to guarantee the performance of the work in accordance with plans prepared by Holabird & Roche, Archs., Monadnock Block. The building will have five stories, with accommodations for 320 patients. It will be 162 ft. long and will have three wings, each 128 ft. William E. Clow, John M. Ewen, E. P. Bicknell and Charles D. Norton are members of the Citizens' Advisory Committee. William Busse is Pres. of the County Bd. and the Citizens' Advisory Com.

CHIPPEWA FALLS, WIS.—Bids are asked until 3 p. m., Oct. 5, by James Knox Taylor, Superv. Arch., Treasury Dept., for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring) of the U. S. post-office at Chippewa Falls.

COLFAX, IOWA.—George P. Stauduhar, 320 20th St., Rock Island, Ill., has let general contract to the TRI-CITY CONSTRUCTION CO., Masonic Temple, Davenport, Iowa, for a 4-story stone and reinforced concrete hotel, at Colfax, for Col. James Donohue, Davenport. Estimated cost, $125,000.

MINNEAPOLIS, MINN.—Mrs. Edna D. Kruse has taken out a building permit for the erection of the Commercial Club and hotel building at 45 Seventh St., South. The cost given in the permit is $450,000. The building will have a frontage of 128 ft., a depth of 128 ft. and a height of 150 ft. Twelve stories are provided for in the plans of Long & Long, Archs., 828 Hennepin Ave. The construction will be of reinforced concrete, brick and terra cotta. C. F. HAGLIN, Lumber Exchange, Minneapolis, is the contractor.

INTERNATIONAL FALLS, MINN.—The Board of County Commissioners, R. H. Olson, Chn., has awarded the contract for a 3-story pressed brick and cut stone courthouse here to NEWMAN & HOY, Chamber of Commerce Bldg., St. Paul, Minn., at $41,750. C. E. Bell, Northwestern Bldg., Minneapolis, Minn., is Arch.

ST. PAUL, MINN.—Plans have been begun by Mark Fitzpatrick, Arch., 17 West Ninth St., St. Paul, for the construction of a 7-story, pressed brick and cut stone, fireproof hotel for W. B. Hatton, city. It will be built east of Wabasha St. Cost, $200,000.

Bids are asked by J. H. Wheeler, Arch., New York Life Bldg., city, until Sept. 5, for the construction of the superstructure of a chapel, dormitory and refectory for St. Agatha's Conservatory at Exchange and Cedar Sts., city. Cost, $65,000.

Bids are asked by the State Board of Control, P. M. Ringdal, Chn., State Capitol, St. Paul, until Aug. 31, for the construction of a model school at the State Normal School at Winona, Minn. Cost, $55,000. On the same date the Board of Control will open bids for the construction of a men's cottage at the State Insane Asylum, at Anoka, Minn. Cost, $50,000. C. H. Johnston, Manhattan Bldg., St. Paul, is Arch.

OMAHA, NEB.—John Latenser, Arch., Bee Bldg., is preparing plans for a court-house building, to be erected on the present site of the old court-house, 17th and Farnam Sts. Estimated cost, $1,000,000.

GREAT FALLS, MONT.—The County Commissioners will call for bids for a detention hospital to be erected on a piece of ground recently purchased near the Poor Farm.

It is expected that bids will be asked for next spring for the $225,000 federal building to be erected in this city.

ST. LOUIS, MO.—Bids are asked by William B. Ittner, Arch., Board of Education Bldg., until Sept. 1 for a 3½-story summer high school building for the Board of Education, Ninth and Locust Sts. Cost, $300,000.

LITTLE ROCK, ARK.—H. F. Auten and Chris Ledwidge will rebuild the Capital Hotel. The structure will have six stories, reinforced with iron and concrete, to contain 200 bedrooms. A two-story colonial porch will be built, the lobby will be 100 ft. deep and 50 ft. wide; interior finish, white marble; grillroom, cafe and barber shop, of white marble wainscoting and tile flooring. The dining-room in old building will be converted into a banquet and convention hall. Estimated cost, $250,000. George R. Mann, Mann Bldg., is Arch. W. R. STEWART, of Little Rock, has contract.

SAN ANTONIO, TEX.—Mauran, Russell & Garden, Archs., Chemical Bldg., St. Louis, are preparing plans for an 8-story hotel building for the San Antonio Hotel Co., San Antonio, Tex. The structure will cost $200,000.

HOUSTON, TEX.—John Barden, of Fort Worth, Tex., was lowest bidder at $410,700 on general contract for construction of the Harris County court-house. Barber Plumbing Co., of Houston, was lowest on power, heat and vacuum-cleaning system, complete, at $21,471; with vacuum system omitted, $1,488 less; with Webster system installed, $600 added; same company also lowest bidder at $8,930 for plumbing. The Barden Electric Co., of Houston, was the only bidder for elevators at $9,198. Lang & Witchell, Dallas, Tex., are Archs.

GUTHRIE, OKLA.—The city will have plans prepared by Charles H. Schoelter, of Muskogee, Okla., for erection of a proposed school building to cost $65,000.

DENVER, COLO.—Press reports state that the German American Trust Co., 1426 16th St., will erect a 3-story office and store building at the corner of 17th and Lawrence Sts. The structure will cost $125,000. Faills & Stein, Colorado Bldg., Denver, are Archs.

John Sanger, of the Ladd-Sanger Construction Co., and associates, will erect an apartment building, 240 × 100 ft. It will extend from Marion St. to Lafayette St. on Eleventh Ave. and will cost $140,000. The structure will be 3½ stories high, and if the alleyway between Marion and Lafayette Sts. and Eleventh and Twelfth Aves. is not closed an archway will be built over the alley and the building will extend above it. The building will be of brick and white stucco, the old English style of architecture being followed. Lyons & Johnson, 1032 15th St., are Agents.

TACOMA, WASH.—CARLSON & HASSLEN, 828 North Prospect St., Tacoma, have been awarded contract for erection of Earlham Court apartment house, three stories, containing 19 apartments, of brick construction. Cost, about $40,000.

SPOKANE, WASH.—An office building, 155 × 50 ft., twelve stories high, to be constructed of steel and reinforced concrete, faced with Roman pressed brick, with terra cotta trimmings, is planned to be erected by the Ross Investment Co. on the west side of Monroe St., between Sprague and First Aves. Plans for the structure have been prepared by G. A. E. Bergholtz, Arch., and it is expected work will be commenced this fall. Cost, $400,000.

SAN FRANCISCO, CAL.—Bids are asked until 11 a. m., Sept. 15, at the office of the Quartermaster, U. S. Marine [illegible]ps, Washington, D. C., for the constru[illegible] and completion of a marine barrack[illegible]d officers' quarters at the naval traini[illegible]ation, San Francisco. Reid Bros., Claus [illegible]els Bldg., are Archs.

OGDEN, UTAH.—Competitive [illegible]wings will be received by Ivy Williams, [illegible], Bd. of Education, until noon, Sept. [illegible] a high school building, to be erected [illegible]roe Ave. and 25th St., the cost not to [illegible] $100,000.

TORONTO, ONT.—Michael [illegible] Buffalo, N. Y., will erect a fireproof [illegible] in Toronto, of steel and concrete [illegible]ction, at a cost of $300,000. Leon H. L[illegible] & Son, 31 Pearl St., Rochester, N. Y., [illegible] Archs.

WINNIPEG, MAN.—ROSS B[illegible] BROWN & BARKER have been awarde[illegible] contract for the construction of the [illegible] Edward school. The contract does not [illegible]de heating and ventilating. Price, $63,[illegible].

TRANQUILLE, B. C.—WILLI[illegible] O'DELL, of Vancouver, B. C., has secu[illegible] the contract for the erection of the con[illegible]tive sanitarium here. The contract p[illegible] $65,000, does not include plumbing, fi[illegible] or furnishings.

MEXICO CITY, MEXICO.—W[illegible] BIRD of this city, who has been awarde[illegible]tract by the Federal Government to bu[illegible] the proposed federal palace, here, is p[illegible]aring to start work at once. It is to [illegible] about $435,000.

WATER SUPPLY—IRRIGATION.

(* *denotes that this work is advertised in Engineering News.*)

MANCHESTER, MASS.—Bids are asked at the office of the Board of Water Commissioners, F. J. Merrill, Chn., until Sept. 4, for erecting a steel standpipe, 60-ft. diameter and 70 ft. high. Raymond C. Allen, of Manchester, is Engr.

EAST BROOKFIELD, MASS.—The contract for laying the pipe for the water system has been awarded to the FRANK W. COWIN CO., of Boston, at the following prices: For 12-in. pipe, 32 cts. per ft.; 10-in., 29 cts.; 8-in., 24 cts.; 6-in., 20 cts.

GARDNER, MASS.—Bids are asked until 2 p. m., Sept. 1, by Charles E. Thompson, Supt., State Colony for the Insane, Gardner, for furnishing about 108 tons of 6-in. c.-i. water pipe and specials. H. K. Barrows, 6 Beacon St., Boston, Mass., is Engr.

PORTLAND, ORE.—See under Miscellaneous Contracts—"Municipal Improvements."

*STAMFORD, CONN.—Bids are asked by the Stamford Water Co., 125 Atlantic St., Stamford, until 2 p. m., Sept. 10, for constructing a dam, together with other works necessary for the enlargement of the reservoir. Albert J. Hatch is Pres.

MERIDEN, CONN.—The Board of Public Works on Aug. 12 awarded the contract for furnishing 190 tons of 12-in. pipe and fittings to extend the water mains to South Meriden to the WARREN FOUNDRY & MACHINE CO., 111 Broadway, New York, at $23.40 per ton for pipe and $47.50 per ton for fittings.

The Board of Water Commissioners, according to reports, has directed specifications prepared for the Lane Pond water supply, bids to be asked to be submitted Aug. 31 for furnishing the pipe needed.

NEW YORK, N. Y.—The following bids were received on Aug. 19 by John H. O'Brien, Comr. Water Supply, Gas and Electricity for furnishing, delivering and erecting four water tube boilers, with economizer, steam and auxiliary piping, feed water heaters and high pressure drip return system and all foundations, with their appurtenances, complete, in the boiler room of the 179th St. Pumping Station, Borough of Manhattan: Evans-Almirall & Co., 281 Water St., New York, $43,000 and $46,500; Heine Safety Boiler Works, 11 Broadway, New York, $44,317; Oil City Boiler Works, 39 Cortlandt St., New York, $41,900.

NEW YORK, N. Y.—Bids are asked until 3 p. m., Sept. 3, by the Park Board for furnishing and delivering 2,500 lin. ft. of 6-in. c.-i. water pipe and 50 street washers, or sprinkling boxes, for parks, Borough of the Bronx, and for furnishing, delivering and laying water mains and appurtenances in the ramble, and in the vicinity of Fifth Ave., between 66th and 69th Sts., all in Central Park, in the Borough of Manhattan, City of New York. Henry Smith is Pres. Bd.

NEW YORK, N. Y.—Bids were received as follows on Aug. 19 by John H. O'Brien, Comr. Water Supply, Gas and Electricity, for furnishing, delivering and laying water mains in Bathgate, Bryant, Johnson, Lafayette and Popham Aves., in Faile, 135th, 133d, 169th, 170th, 176th, 189th and in 259th Sts., Borough of the Bronx: The Welton Construction Co., 119 Elliott Ave., New York, $71,763; Jas. A. Petelle & Co., 3300 Olinville Ave., the Bronx, $69,355; Jas. H. Rodgers, 1929 Amsterdam Ave., New York, $69,521; Jas. Burns, 147 East 125th St., New York, $69,744; Clinton Beckworth, Herkimer, N. Y., $73,298; Hanover Contg. Co., 129 West 125th St., New York, $84,728; P. Goodman, 199 Southern Boulevard, New York, $80,832; Louis D. Gregory, 342 East 125th St., New York, $56,539.

NEW YORK, N. Y.—Justice Pound, in the Supreme Court, on Aug. 20, decided that the temporary injunction obtained by Willis Holly restraining John H. O'Brien, Comr. Water Supply, Gas and Electricity, and the city from accepting the bid of the T. A. Gillespie Co., 90 West St., for the contract for laying two miles of water pipes on Long Island from Valley Stream to Amityville, should be continued and remain in force until the action can be tried and all the facts determined. Noted on Aug. 13.

SYRACUSE, N. Y.—HENRY TOSH & SON have been awarded the contract at $15,027 for delivering the materials for the second Skaneateles Lake water conduit by the Board of Contract and Supply.

*COHOES, N. Y.—The Board of Water Commissioners have prepared some general specifications and information for the guid-

ance of filter companies and contractors who may desire to submit detailed plans, specifications and proposals for the construction of a mechanical filtration plant for the city. The specifications and information will be mailed on application to the Board of Water Commissioners. A. T. Kniffin is Supt.

TRENTON, N. J.—The Board of Water Commissioners on Aug. 12 opened bids for the construction and installation of a pumping engine of the vertical triple-expansion type, with tank and flywheel, capable of pumping 20,000,000 U. S. standard gallons of water every 24 hrs. at the pump house on Calhoun St. The bids follow: Camden Iron Works, Ninth and Norris Sts., Philadelphia, Pa., $84,500; The Hooven-Owens-Rentschler Co., of Hamilton, Ohio, $87,300; Holly Manufacturing Co., of Buffalo, N. Y., $91,769; Allis-Chalmers Co., of Milwaukee, Wis., $92,900; Wisconsin Engine Co., of Corliss, Wis., $95,...; Southwark Machine Co., of Philadelphia, Pa., $91,500; Bethlehem Steel Co., of South Bethlehem, Pa., $98,525; Platt Iron Works, of Dayton, Ohio, $107,500. Chas. A. Hague is Consulting Engr., 52 Broadway, New York.

*READING, PA.—Bids are asked until 7.30 p. m., Sept. 22, by the Board of Water Commissioners for constructing slow sand filters for the Maiden Creek water supply. Lincoln S. Ramsey is Secy.

*DE FUNIAK SPRINGS, FLA.—We are officially advised that J. B. McCRARY & CO., Empire Bldg., Atlanta, Ga., have been awarded the contract for the construction of the water-works system here at $17,-822. Bids were opened on Aug. 14. The Solomon-Norcross Co., Candler Bldg., Atlanta, are Engrs.

LEXINGTON, TENN.—The city is considering the construction of a water-works system.

WELLSVILLE, OHIO.—Bids are asked until noon, Sept. 5, by the Board of Public Service for constructing the new steel water supply cribs and their pipe connections to the existing suction lines, all out into the Ohio River. Charles C. Ewing, Wellsville, is Supt.

CRESTON, ILL.—BELLIS & GALE, of Oregon, Ill., have been awarded the contract for three blocks of water mains to be laid here.

WARSAW, ILL.—Bids are asked until Sept. 2 by the city for the construction of water-works here. A. H. Worthen is City Clk. George Cadogan Morgan, 803 Royal Insurance Bldg., Chicago, Ill., is Engr.

ROBINSON, ILL.—The Robinson Water, Light & Heat Co., Robinson, will spend $35,000 in the reconstruction of its water and light plant, which will include the purchase of 27,000 ft. of water mains. E. B. Pollister is Mgr.

*NEW BOSTON, ILL.—We are officially advised that the Commissioners of the Bay Island Drainage and Levee District No. 1 on Aug. 17 rejected all the bids for the Bay Island Drainage and Levee District pumping plant, which were received on July 29. The specifications will be modified and bids will again be asked. Noted on Aug. 6. The Harman Engineering Co., 120 Fredonia Ave., Peoria, are Engrs.

EARLHAM, IOWA.—Bids are asked until Sept. 1 by the city for the construction of water-works and an electric light plant. Estimated cost, about $17,000. The Des Moines Bridge & Iron Works, of Des Moines, are Engrs.

EVELETH, MINN.—The contract for constructing 1,250 ft. of water mains in Grant Ave. has been awarded to PASTORET & LUNZ, of Two Harbors, Minn., at $3,994.

MINNESOTA LAKE, MINN.—The Village Council has authorized the construction of a water system in Lake Ave.

HOLYROOD, KAN.—Bids are asked until Sept. 8 by the city for the construction of water-works. Estimated cost, about $12,000. George Cadogan Morgan, 803 Royal Insurance Bldg., Chicago, Ill., is Engr.

*LINCOLN, NEB.—Bids were opened on Aug. 14 by the Water Committee of the City Council for the construction of a reservoir of 1,700,000 gallons capacity, to be located at the Mockett pumping station. The bids follow: Gould Construction Co., Davenport, Iowa, $20,577; Cook Construction Co., Des Moines, Iowa, $17,057; William Worthman, Lincoln, $17,250; Olson & Lawrence, Lincoln, $22,525; M. Ford, Cedar Rapids, $15,-999 and $16,394; American Light & Water Co., Kansas City, Mo., $16,027 and $16,880. William Grant is City Engr.

*PLATTE, S. DAK.—Plans and specifications are on file at the office of Engineering News, New York, for the construction of water-works here. Bids are asked until Sept. 2.

WYNCOTE, WYO.—The Secretary of the Interior has suspended the contract with the S. R. H. Robinson & Son Contracting Co., Chemical Bldg., St. Louis, Mo., for the construction of the diversion dam and headworks in connection with the North Platte irrigation project, Nebraska-Wyoming, and authorized the Reclamation Service to complete the work by force account. This structure is located near Whalen, Wyo.

HUGO, OKLA.—Bids will probably soon be asked by the city for the construction of water-works, for which $150,000 of bonds were voted. The plant will consist of pumping station, about 15 miles of mains, 60 fire plugs and a 2,000,000-gallon reservoir. Hiram Philips, St. Louis, Mo., is Consulting Engr.

DELTA, COLO.—Plans for the construction of the Jumbo reservoir and irrigating ditch in Delta County, have been filed with the State Engineer for approval. The proposed reservoir is to cover an area of 160 acres and the ditch will irrigate about 4,000 acres. Estimated cost, $40,000.

BOULDER, COLO.—C. W. McCarthy, of Holdrege, Neb., and others have filed plans for the construction of a storage reservoir to be constructed for the use of Boulder County.

*KLAMATH FALLS, ORE.—The Secretary of the Interior has authorized the Reclamation Service to begin the construction of the Clear Lake dam, Klamath project, Oregon, by force account. The total estimated cost of this work is approximately $165,000. Bids for the erection of this structure have been rejected on the grounds of excessive cost, and it is believed that the work can be carried on effectively and economically with the force in hand.

PHOENIX, ARIZ.—The Secretary of the Interior has approved the contract entered into by Mr. Louis C. Hill, Supervising Engr., in the Reclamation Service on behalf of the United States, and the PIONEER & CONSOLIDATED TRANSFER & STORAGE CO., of Phoenix, Ariz., for furnishing and hauling about 33,000 bbls. of fuel oil for use in the cement mill, Salt River irrigation project. The estimated total amount of the contract will be $145,200.

SALT LAKE CITY, UTAH.—According to the Salt Lake City Tribune an irrigation project to be financed by private capital has been inaugurated by Frank H. Buhl, Sharon, Pa., and others. This project will necessitate the expenditure of $15,000,000, will mean the construction of 9,000 miles of main and lateral canals and the building of storage reservoirs. The amount of land to be segregated will be 540,000 acres, which segregation was granted by the State Land Board on Aug. 10. Kuhn Bros., 213 Fourth St., Pittsburg, Pa., are interested.

ASHTON, IDAHO.—The town has let the contract to the McMULLEN HEATING & PLUMBING CO., of Idaho Falls, Idaho, for the construction of the water system at $9,000.

OTTAWA, ONT.—The Civic Water-works Committee have approved the recommendation of the City Engineer for the immediate construction of that section of the new aqueduct which is to be built near Kopean Bay. Estimated cost, $74,000.

FORT WILLIAM, ONT.—The ratepayers have passed a by-law to provide an additional $90,000 for further work on the Loch Lomond water supply project. A. Whalen is Mayor.

NANAIMO, B. C.—Col. T. H. Tracy, of Vancouver, B. C., has been retained to make surveys for a permanent water supply for this city. Estimated cost, about $100,000.

PORTAGE LA PRAIRIE, MAN.—The contract for laying the 12-in intake pipe, 404 ft. long, has been awarded to HOLMES & KIRKMOND at $3,630. Murphy Bros. also bid on this work.

SEWERAGE.

(denotes that this work is advertised in Engineering News.)*

*CANAJOHARIE, N. Y.—The following bids were received on Aug. 17th for storm sewer construction in this village: GOODALE & JEMISON, Schenectady, N. Y., $3,052 (awarded contract); D. I. Snell & Co., Canajoharie, $3,898; J. A. & G. Karg, Johnstown, N. Y., $3,560; F. W. Schuyler, Fort Plain, N. Y., $4.142.

BROOKLYN, N. Y.—Bids are asked until 11 a. m., Sept. 9, by Bird S. Coler, Boro. Pres., for constructing sewers in portions of certain streets.

GATES, N. Y.—WILLIAM FULLER was awarded the contract on Aug. 14 by the city for constructing a sewer in Jay St. at $20,-936.

*SARANAC LAKE, N. Y.—Bids are asked until 1.30 p. m., Sept. 8, by the Sewer and Water Board for the construction of about two miles of sewers from 6 to 10 ins. in diameter. Seaver A. Miller is Village Clk. John S. Collins, 440 Broadway, Albany, N. Y., is Engr.

BROOKLYN, N. Y.—Bids are asked until 11 a. m., Sept. 9, by Bird S. Coler, Boro. Pres., for furnishing all the labor and material required for constructing sewers in Scott Ave., from Newtown Creek, north of Metropolitan Ave., to St. Nicholas Ave., etc., Section 2.

WESTFIELD, N. J.—EUGENE CHAMBERLAIN has been awarded the contract for constructing the Kimball Ave. sewer extension.

BOUND BROOK, N. J.—Bids are asked until 8 p. m., Sept. 1, by the Mayor and Council for about 1,127 ft. of pipe sewer in Talmage Ave. and North St. Fred. N. Voorhees is Boro. Clk.

RUTHERFORD, N. J.—Bids are asked until 8 p. m., Aug. 28, by the Borough Council for the extension and construction of a 24-in. vitrified pipe drain in Park Ave. F. A. Stedman is Boro. Clk.

RIDGWAY, PA.—Bids are asked until Aug. 31 by G. F. Grenier, Boro. Secy., for furnishing material, exclusive of terra cotta pipe required, and constructing a system of sanitary sewers, including 3,300 ft. of 15-in., 4,920 ft. of 8-in. and 4,830 ft. of 6-in. pipe and 29 manholes. F. W. Ward is Boro. Engr.

DOVER, DEL.—L. W. CLIFTON, of Dover, has been awarded the contract for constructing the Division St. sewer, at $5,490.

WASHINGTON, D. C.—The R. I. BEALL CONSTR. CO., of Washington, has been awarded the contract by the Commissioners of the District of Columbia for constructing sewers in Arkansas and New Hampshire Aves. Bids were opened on Aug. 17, at $4,-317.

*LOUISVILLE, KY.—Shultz & Vogt were the lowest bidders on Aug. 14 for the construction of Section C of the southern outfall sewer, and the contract probably will be awarded to them as soon as the official figures are gone over by the Sewer Commission.

CLEVELAND, OHIO.—The contract for the construction of the portion of the intercepting sewer between East 40th St. and Marquette Ave. N. E., was awarded to THOMAS W. NICHOLSON on Aug. 14 by the Board of Public Service. Noted on Aug. 13.

LORAIN, OHIO.—Bids are asked until noon, Sept. 5, by the Board of Public Service for constructing sewers in various streets. John Gard is Pres. Bd.

LORAINE, OHIO.—An ordinance providing for the issuance of bonds for $26,000 for the construction of sewers in Oberlin, Hoyt and Alten Sts. has been passed by the Council.

NORMAL CITY (Muncie post-office), IND. —Bids are asked by the Trustees until Sept. 8, for the construction of a sewer in McKinley Ave. James G. Mendanhall is City Clk.

KENDALLVILLE, IND.—Bids are asked by the city until Sept. 7, for the construction of a sewer. Estimated cost, $15,000. W. R. Myers is City Clk.

COLUMBUS, IND.—Bids are asked by L. F. Orr, City Clk., until 7.30 p. m., Sept. 7, for the construction of a lateral sewer system.

*PEORIA, ILL.—Bids are asked until 2 p. m., Sept. 15, by the City Council, for the construction of the North Peoria sewer. Isaac J. Levinson is Secy.

ISHPEMING, MICH.—JOHNSON & MUNSON, Ishpeming, have been awarded the contract at $9,594, for furnishing and laying the sewer pipes in the Cleveland Iron Mining Co.'s second and third additions.

CHICAGO, ILL.—Bids are asked until noon, Aug. 28, by the Special Park Commission, A. W. O'Neill, Secy., Room 501, 200 Randolph St., for installing a system of surface drainage and sewer piping at the Wrightwood Ave. municipal playground.

LITCHFIELD, ILL.—The Board of Local Improvements awarded the contract on Aug. 15 to the FEDERAL IMPROVEMENT CO., 145 La Salle St., Chicago, Ill., for the construction of the South St. sewer at $27,896. J. W. Farley, of Chicago, bid $33221 for this work.

HUDSON, WIS.—Bids are asked until 8 p. m., Sept. 8, by A. Karras, City Clk., for constructing a sewer in Second St.

CRESCO, IOWA.—Bids are asked until 8.30 p. m., Sept. 7, by the City Clerk, for constructing 2,875 ft. of 8-in. vitrified pipe sewer and 2,475 ft. of 4-in. agricultural tile.

CEDAR RAPIDS, IOWA.—M. FORD was awarded the contract on Aug. 11 by the City Council for the construction of brick and pipe sewers at $6,985.

CROOKSTON, MINN.—Bids are asked by the City Council until 8 p. m., Sept. 8, for the construction of sewers in Alexander Ave., Summit Ave., and Manitoba St. A. M. Childs is City Clk.

MAPLETON, MINN.—JOHN McCALL has been awarded the contract for constructing 1,800 ft. of sewer extensions.

LARNED, KAN.—The following are the bids received on Aug. 8 by the city for constructing 21,000 ft. of sewers: The THOMPSON CONSTRUCTION CO., New York Life Bldg., Kansas City, Mo., $9,650 (awarded contract); Municipal Construction Co., Kansas City, Mo., $10,534; Lund & Bailey, Blackwell, Okla., $11,110; J. J. Donegan, Shenandoah, Iowa, $11,495; Chas. T. Derr, Oklahoma City, Okla., $11,425; W. F. Hall, Clinton, Mo., $11,630; G. W. Roberts, Kansas City, Mo., $10,800; J. W. Turner, Des Moines, $12,-415; Baker & Chann, Wichita, Kan., $11,-943; W. W. Gilmore, Topeka, Kan., $11,600. W. F. Peter is City Clk.

LAWRENCE, KAN.—We are officially advised that contracts have been awarded by the city as follows: GRAEBER BROS., Lawrence, 4,500 ft. 8-in. pipe sewers at 53 cts.; 330 ft. 10-in. pipe sewers at $1.29.

LAWRENCE, KAN.—Bids are asked until 5 p. m., Sept. 1, by F. D. Brooks, City Clk., for constructing 6,000 ft. of 12-in. vitrified pipe sewer in the east and southeast portions of the city; also for constructing 1,500 ft. of 15-in. vitrified pipe sewer in Maryland St. Holland Wheeler is City Engr.

FAIRBURY, NEB.—W. W. Watson, City Engr., has awarded contracts for 8-in. lateral sewers to LANG & BROWETT, University Place, Neb., at the following prices: District No. 10, 2,012 ft. at 47 cts. per ft.; District No. 11, 998 ft. at 84 cts.; manholes $4.60 per ft., 10 ft.; flush tanks, $80.

MITCHELL, S. D.—Bids are asked until 8 p. m., Sept. 7, by L. L. Ness, City Audr., for labor and material for constructing a storm sewer.

NEWPORT, ARK.—LUND & HILL, of Little Rock, Ark., have been awarded the contract for the engineering work for the new sewer system which is to be constructed here. The system is to include the entire city of Newport. Estimated cost, about $50,-000.

STERLING, COLO.—Bids are asked until 9 a. m., Aug. 31, by Chas. F. Silver, Town Clk., for labor and materials for constructing sewer, the work including 25,575 lin. ft. of 8-in., 11,290 lin. ft. of 10-in., 2,980 lin. ft. of 12-in., 5,929 lin. ft. of 15-in., and 5,-074 lin. ft. of 18-in. pipe sewer, 12 lamp holes complete, with covers, and 110 manholes complete.

TACOMA, WASH.—H. J. McGregor, Comr. Pub. Wks., on Aug. 13 awarded to the COAST CONTRACTING CO. the contract for laying sewers in a district bounded by 41st, 46th, South Hosmer and I Sts., at $25,516. The work is in what is known as local improvement district No. 178. The engineer's estimate of cost was $28,274. There were five other bidders, as follows: F. A. Kessel, $25,604; Worter Bros., $25,575; Lister Construction Co., $26,844; N. Maruca, $26,107; M. J. Hickey, $27,963. F. L. Davis is City Engr.

PORTLAND, ORE.—See under Miscellaneous Contracts—"Municipal Improvements."

OAKLAND, CAL.—Bids are asked until 11 a. m., Sept. 9, by the Board of Public Works for the construction of a vitrified pipe sewer in Fallon, Sixth and Oak Sts. Walter B. Fawcett is Secy. Bd.

SALT LAKE CITY, UTAH.—We are officially advised that J. D. HANLEY has been awarded the contract by the Board of Public Works for the construction of sewer extension No. 200. Louis C. Kelsey is City Engr.

WALLACE, IDAHO. — The city contemplates expending about $10,000 for the construction of new sewers. H. M. Lancaster, of Wallace is Engr.

PRESTON, ONT.—The CONCRETE ENGINEERING & CONSTRUCTION CO., Toronto, have been awarded the contract for laying sewers here. The CANADIAN GENERAL ELECTRIC CO. has secured the contract for the pumping apparatus.

HAMILTON, ONT.—The SMART-TURNER MACHINE CO., Ltd., Hamilton, has secured the contract for furnishing to the city a duplex pump for the sewage disposal works.

GARBAGE DISPOSAL.

(denotes that this work is advertised in Engineering News.)*

BUFFALO, N. Y.—Bids are asked until Aug. 28 by the Department Public Works, F. G. Ward, Comr., for furnishing material and erecting a furnace at the Refuse Utilization Plant, Hamburg Canal.

*MONT ALTO, PA.—Dr. Samuel G. Dixon, State Health Comr., Mont Alto, has awarded the contract for a garbage disposal plant at the Pennsylvania State South Mountain Sanatorium to the DIXON ENGINEERING & CONSTRUCTION CO., of Toledo, Ohio. Bids were received as follows, based upon original plans and specifications prepared by the bidders, and conforming to a general specification issued by the Department of Health: Morse-Boulger Destructor Co., New York, incinerating plant with steel stack and woodsteel superstructure, $3,850; additional unit, $3,000; Kellar & Price, Lancaster, Pa., incinerating furnace with steel stack and steel superstructure, $5,900; Lewis & Kitchen, Chicago, Ill., incinerating furnace with woodsteel superstructure and steel stack, $4,200; additional units, $720; Dixon Engineering & Construction Co., Toledo, Ohio, incinerating furnace with steel stack and brick superstructure, $2,200; first additional unit, $1,-700; second additional unit, $2,100.

STREETS AND ROADS.

(denotes that this work is advertised in Engineering News.)*

HARTFORD, CONN.—Two bids were received by the Board of Contract and Supply on Aug. 17, for paving American Row, Central Row and State St. The Southern New England Paving Co. for granite, from $2.48 to $2.90 per sq. yd., depending on the kind of stone used; $6.35 per cu. yd. for concrete filler; and $1.65 per sq. yd. for asphalt pavement; A. W. Byrne, of Boston, Mass., $2 per sq. yd. for asphalt; $3.10 per sq. yd. for granite, and $6.25 per cu. yd. for concrete filler. The bids were referred to the City Engineer for computation.

HARTFORD, CONN.—The following bids were opened at the office of the State Highway Commissioner on Aug. 24: Town of Ashford, five sections of graded gravel, 2,673 lin. ft., Leonardo Suzio, Meriden, Conn., $5,-250; A. Brazos & Sons, Middletown, $5,360; A. Bridges' Sons, Hazardville, $5,525. Suzio bid 90 cts. per lin. ft. extra for telford. Town of Stratford, 3,116 lin. ft. macadam, B. D. Pierce, Jr., Co., Bridgeport, $4,331, and $1 per lin. ft. extra for rubble drain. Town of Washington, 2,500 lin. ft. of macadam, with retaining wall, Lane Construction Co., Meriden, $3.24 and $4; B. D. Pierce, Jr., Co., Bridgeport, $2.83 and $4.75; F. T. Leey Co., Springfield, Mass., $3.68 and $3.50; Jos. Mascetti, Torrington, $3.25 and $3.25; T. H. Gill Co., Boston, Mass., $2.76 and 6. Town of Windsor Locks, 4,730 lin. ft. of macadam and telford, O. T. Benedict, Pittsfield, Mass., $2.10 macadam, $2.60 telford; A. Bridges' Sons, Hazardville, $2.74 and $3.84; A. Brazos & Sons, Middletown, $1.98 and 2.85. Town of Wethersfield, 11,125 lin. ft. of macadam, telford, gravel and gravel telford, O. T. Benedict, Pittsfield, Mass., $2.99, $3.49, $2.49, $2.99; Connecticut Contracting Co., Middletown, $2.75, $3.25, $2.50, $2.90; Pierson Engineering & Construction Co., Bristol, $2.45, $2.95, $2.45, $2.95; F. Arrigoni & Bro., Durham, $2.24, $2.84, $2.10, $2.70; C. W. Blakesless & Sons, New Haven, $2.14, $2.94, $1.74, $2.60. The following contractors bid on macadam and macadam-telford only: A. Brazos & Sons, Middletown, $1.86 and $2.54; A. Bridges' Sons, Hazardville, $2.63 and $3.23; Lane Construction Co., Meeriden, $2.32 and $2.92; John F. Gill Co., Boston, $3.80 and $4.70. Town of New Canaan, 3,657 lin. ft. of macadam, O. T. Benedict, Pittsfield, Mass., $2.50 and $2.25 for native stone; Lane Construction Co., Meriden, $2.27 for native stone; J. F. Silliman, New Canaan, $2.47 and $2.21; B. D. Pierce, Jr., Co., Bridgeport, $2.25 and $2. Town of Westbrook, 9,000 lin. ft. special treatment, Pierson Engineering & Construction Co., Bristol, $4,500; A. Bridges' Sons, Hazardville, $6,300; A. Brazos & Sons, Middletown, $6,890; Lane Construction Co., $5,-910. Town of Meeriden, 900 lin. ft. rubble drain and special treatment, Thomas Kearney, Meriden, $1,305; L. Suzio, Meriden, Conn., $1,458. Town of Rocky Hill, 7,100 lin. ft. of macadam and telford. O. T. Benedict, Pittsfield, Mass., $2.45 and $2.95; Pierson Engineering & Construction Co., Bristol, $2.10 and $2.60; F. Arrigoni & Bro., Meriden, $1.66 and $2.10; A. Brazos & Sons, Middletown, $1.85 and $2.35; A. Bridges' Sons, Hazardville, $2.29 and $3.09; Lane Construction Co., Meriden, $1.87 and $2.38; C. W. Tryon, Meriden, $2.27 and $2.90; F. T. Ley Co., Springfield, Mass., $2.58 and $2.83; C. W. Blakeslee & Sons, New Haven, $1.65 and $2.40.

BROOKLYN, N. Y.—Bids were received as follows on Aug. 19 by Bird S. Coler, Boro. Pres., for (a) regulating and repaving with iron slag pavement on a concrete foundation the roadway of 40th St., from Fourth Ave. to Fifth Ave., together with all work incidental thereto; (b) regulating and repaving with iron slag pavement on a concrete foundation the roadway of 54th St., from Third Ave. to Fourth Ave., together with all work incidental thereto; (c) regulating and repaving with iron slag pavement on a concrete foundation the roadway of 59th St., from Third Ave. to Fourth Ave., together with all work inciden'al thereto; (d) regulating and repaving with asphalt pavement on a concrete foundation the roadway of 59th St., from Fourth Ave. to Sixth Ave., together with all work incidental thereto; (e) regulating and repaving with iron slag pavement on

a concrete foundation, 33d St., from Third Ave. to Fourth Ave., together with all work incidental thereto: The Scoria Paving Co., (a) $13,025, (b) $12,454, (c) $12,537, (d) $12,537, (e) $12,420; Borough Construction Co., 44 Court St., Brooklyn, (a) $10,816, (b) $10,341, (c) $10,410, (d) $10,260, (e) $10,463; Charles Meade & Co., 299 Broadway, New York, (a) $10,327, (b) $9,893, (c) $9,974, (d) $9,260, (e) $9,880; Louis Lilley, 125 Myrtle Ave., Brooklyn, (a) $12,121; Charles Cranford, Foster Ave., Brooklyn, (a) $11,710, (b) $11,243, (c) $11,357, (d) $11,156, (e) $11,254; Uvalde Asphalt Paving Co., 1 Broadway, New York, (a) $10,225, (b) $9,871, (c) $10,002, (d) $9,791, (e) $10,061; Atlanta Contracting Co., 434 East 91st St., New York, (a) $11,475, (b) $10,995, (c) $11,087, (d) $11,228, (e) $10,988.

BROOKLYN, N. Y.—Bids are asked by Bird S. Coler, Boro. Pres., until 11 a. m., Sept. 9, for regulating, grading, repaving, guttering, laying sidewalks in various streets.

BROOKLYN, N. Y.—Bids were received as follows on Aug. 19 by Bird S. Coler, Boro. Pres., for furnishing and delivering 500 net tons of refined asphalt at the Municipal Asphalt Plant, at Sixth St. and Gowanus Canal, Brooklyn, (a) per ton, (b) totals: A. L. Barber Asphalt Co., 90 West St., New York, (a) $28.40, (b) $14,200; Union Oil Co. of California, 17 Battery Place, New York, (a) $22.35, (b) $11,175; Globe Asphalt Co., (a) $24.95, (b) $12,475; Warren Chemical & Mfg. Co., 17 Battery Place, New York, (a) $28.00, (b) $14,000; The Texas Co., 17 Battery Place, New York, (a) $18.70, (b) $9,350.

Bids were received as follows for regulating and repaving with granite pavement on a concrete foundation the roadway of Kent Ave., from Broadway to North Sixth St., together with all work incidental thereto: Norton & Gorman Construction Co., 303 Douglas St., Brooklyn, $25,205; James Quinn, Jr., 36 Kenmore Ave., Brooklyn, $25,811; Henry B. George, 249 Washington St., Brooklyn, $25,765; Mathew T. Magher, 15 Orient Ave., Brooklyn, $26,982; John E. Monahan Constructing Co., 496 Manhattan Ave., Brooklyn, $27,161; O'Grady Bros., 79 North Eighth St., Brooklyn, $24,367.

Bids were received as follows on Aug. 19 for regulating and repaving with granite pavement on a concrete foundation the roadway of Columbia St., from Harrison St. to Hamilton Ave., together with all work incidental thereto: Norton & Gorman Construction Co., 303 Douglas St., Brooklyn, $20,913; Atlanta Constructing Co., 434 E. 91st St., New York, $20,767; M. F. Hickey, Second Ave. and Sixth St., Brooklyn, $20,879; Thomas Cornell, 315 Fourth Ave., Brooklyn, $21,381; James Quinn, Jr., 36 Kenmore Ave., Brooklyn, $22,303; Charles Cranford, Foster Ave., Brooklyn, $21,430.

NEW YORK, N. Y.—Bids are asked by the Park Board until 3 p. m., Sept. 10, for furnishing all the labor and materials for constructing and laying hexagonal asphalt block walks, from Bartow Station to the City Island Bridge, in Pelham Bay Park, and from the junction of Jerome Ave. and Mosholu Parkway to the Van Cortlandt Station in Van Cortlandt Park, City of New York.

NEW YORK, N. Y.—Bids are asked by Allen N. Spooner, Comr. of Docks, until noon, Sept. 3, for furnishing all the labor and materials required for preparing for and paving with asphalt the decks of certain piers on the North, East and Harlem Rivers, and for laying asphalt granite block or iron slag block pavement on new-made land between East 23d and East 24th Sts., East River, Boro. of Manhattan.

LONG ISLAND CITY (L. I.), N. Y.—Bids are asked until 11 a. m., Sept. 1, by Lawrence Gresser, Pres. Boro. of Queens, for regulating, paving, etc., certain streets.

*SARANAC LAKE, N. Y.—We are officially advised that bids were received as follows on Aug. 11 for constructing about 3,500 lin. ft. of cement sidewalk: Eldridge & Grannis, Ossining, N. Y., sidewalk with curb, 18 cts. per sq. ft.; without curb, 16 cts.; tamping subgrade, 4 cts.; earth excavation, 50 cts. per cu. yd.; excavating boulders measuring less than ½ cu. yd., $2.50; Elmer F. Leach, Green, N. Y., 19 7-10 cts., 12½ cts., 9 cts., 79 cts., $2.50; C. Malone, Lake Placid, N. Y., 22 cts., 17¾ cts., no bid, no bid, no bid; R. Malone, Saranac Lake, 23 cts., 19 cts., 12 cts., $1.25, $3.25; W. F. Warren, Mount Vernon, N. Y., 21 cts., 17¾ cts., 5 cts., 33 cts., no bid; Hugh Heverin, Syracuse, N. Y., 22½ cts., 17 cts., 20 cts., 60 cts., no bid; Golden & Lansing, Troy, N. Y., 19 cts., 18¾ cts., no bid, 70 cts., $3.50. D. F. McLeod is Village Engr.

FORT EDWARD, N. Y.—Bids were opened on Aug. 13 for paving here instead of Aug. 31 as incorrectly stated on Aug. 13. The contract was awarded by the Board of Trustees, we are advised, to JAMESON & GOODALE, of Schenectady, N. Y., for Clearfield brick on Broadway and Standard brick on East St., at $2.39 and $2.42, respectively.

The contract for combined concrete curb and gutter was let to F. A. WEED & CO., of Schenectady, at 60 cts. per lin. ft. Estimated cost of entire work, $58,000. F. E. Crane, Amsterdam, N. Y., is Engr.

*JAMESBURG, N. J.—Plans and specifications are on file at the office of Engineering News, New York, for the construction of a stone road at the New Jersey State Home for Boys, Jamesburg. Bids are asked until Sept. 2.

*ASBURY PARK, N. J.—The UNITED PAVING CO., Atlantic City, N. J., has been awarded the contract by the City Council for paving Mattison Ave., from Main St. to Cookman Ave., and Bond St., from Cookman Ave. to Summerfield Ave., about 6,100 sq. yds., with bitulithic, at $2.69 per sq. yd., 5-yr. guarantee. William C. Burroughs is City Clk.

PHILADELPHIA, PA.—Bids are asked until Sept. 1, by George R. Stearns, Dir. Pub. Wks., for grade crossing work, including paving, grading and sewers.

HARRISBURG, PA.—Bids are asked until noon, Aug. 29, by W. W. Caldwell, Comr. of Highways, for paving and curbing Green St.

ERIE, PA.—JOHN McCORMICK & SONS were awarded the contract for paving Eleventh St., from East Ave. to Pennsylvania Ave., at the following prices: Asphalt top, Trinidad, $1.04 per yd., 60 cts. for concrete base, 40 cts. for artificial curbing, $45 for catch basins, and $1.00 for every foot of 9-in. pipe laid. Mayer Bros. also submitted a bid at $1.10 for asphalt and 64 cts. for concrete base. Bids were opened on Aug. 17.

PITTSBURG, PA.—Contracts have been awarded by the County Commissioners for the construction of nine roads. The roads to be improved, the successful bidders and their bids follow: Dorseyville and Culmerville Road, COLLINS & GORDON, 407 Fourth Ave., Pittsburg, $90,160; Saltsburg extension, same, $28,751; State road, FOLEY BROS., $84,704; Evergreen and Lowries Run road, same, $14,949; Windgap road, McLAUGHLIN CONSTRUCTION CO., $18,410; Three Degree road, H. HILEMAN, $91,817; Little Pine Creek extension, DONALD McNEIL, $38,565; Noblestown extension, W. W. KELLY, 502 Fifth Ave., $21,343; Leechburg extension, NEELEN & DALY, $19,558; G. T. Barnsley is County Road Engr.

INGRAM, PA.—Bids are asked by D. H. Hainer, Boro. Clk., until 5 p. m., Sept. 7, for grading, paving and curbing a portion of Ingram Ave.

ELIZABETH, PA.—A. Ancorine has submitted the lowest bid on a 3-mile section of county road between here and McKeesport, Pa., at $43,447. The award was not made, as the contractor had never built any roads.

BALTIMORE, MD.—WARREN BROS., Fidelity Bldg., Baltimore, were awarded the contract on Aug. 19 by the Board of Awards for bitulithic paving on Seventh and Eighth Sts. and Walbrook and Clifton Aves., at $2.34, $2.34, $2.19 and $2.19 per sq. yd., respectively. B. T. Fendall is City Engr.

CHASE CITY, VA.—Chase City District has voted $60,000 of bonds for the construction of 24 miles of roads, the roads to be 16 ft. wide, 8 ft. of which will be macadamized.

PHILIPPI, W. VA.—The city has voted $16,000 of bonds for street paving.

CHARLESTON, S. C.—BOWE & PAGE, 70 Wentworth St., Charleston, have been awarded the contract by the Board of Public Works for laying 30,000 sq. yds. of brick paving here at $1.44 per sq. yd., or $43,200. The work is to be completed within five months, and will start in the next 30 days. Catskill vitrified brick will be used.

SPARTANBURG, S. C.—W. F. BOWE, Augusta, Ga., has been awarded the contract at $2.06¼ per sq. yd. for paving Ezell and West Main Sts. with granite blocks, approximately 10,000 sq. yds., at about $15,000. Fred L. Bryant is City Engr.

ROME, GA.—The contract for paving streets with vitrified brick, the work embracing about 12,000 cu. yds. of excavation, furnishing and setting 12,000 lin. ft. of granite curb and concrete foundations, and surfacing 41,000 sq. yds. of pavement, has been awarded to the GEORGIA ENGINEERING & CONSTRUCTION CO., the lowest bidder, at $103,502. Hazelhurst & Anderson, Candler Bldg., Atlanta, Ga., are Engrs. Noted last week.

PALATKA, FLA.—BIGLER BROS., of Mobile, Ala., have been awarded the contract for laying 200,000 sq. ft. of cement sidewalks here.

GURLEY, ALA.—The city has decided to pave two streets with vitrified brick.

WOODVILLE, ALA.—Jackson County awarded the contract for constructing a road from Woodville to Point Rock, three miles in length, to JOHN H. WILLIAMSON and J. P. WEBB, of Scottsboro, at $6,360.

JACKSBORO, TENN.—JOHN L. O'CONNOR, Knoxville, Tenn., has been awarded the contract at about $26,000 to construct various roads in Campbell County.

NASHVILLE, TENN.—The city has voted $50,000 of bonds for laying sidewalks and curbing. James S. Brown is Mayor.

TOLEDO, OHIO.—GARRIGAN BROS. have been awarded the contract, at $18,092, for constructing a 3-mile road in Oregon and Jerusalem Townships, and at $9,490, for 1¼-mile improvement of the Curtice Road in Jerusalem Township.

DELPHOS, OHIO.—J. E. CONLEY & CO. have been awarded the contract at $53,000, for paving portions of Main, Second, Third and Fifth Sts., with Trimble paving blocks.

RAVENNA, OHIO.—The ADAMS BROS. CONTRACTING CO., Zanesville, Ohio, has been awarded the contract for 34,000 yds. of brick paving on a concrete base, 19,000 ft. of stone curbing and about 11,000 ft. of sewer.

YOUNGSTOWN, OHIO.—Bids are asked until noon, Aug. 28, by the County Commissioner for grading and macadamizing two miles of road in Boardman and Poland Townships. Specifications may be obtained from James C. Wonders, State Highway Comr., Columbus, Ohio.

MARTIN'S FERRY, OHIO.—T. J. STRINGER, of Rayland, Ohio, has been awarded the contract for the construction of a brick state road from the Gaylord mine to the Jefferson County line, a distance of about two miles.

LORAIN, OHIO.—The Board of Public Service on Aug. 17 awarded the contract for paving Franklin St. to W. S. PACE, the lowest bidder, at about $18,793.

ZANESVILLE, OHIO.—T. M. LYNN was awarded the contract by the Board of Public Service on Aug. 15 for paving Maysville Ave. at $16,277. Other bids were: J. E. Grown, $18,540; J. C. Williams, $16,426; Adams Bros., $17,260; Dunsweiler Bros., $18,855; Petit & Abele, $17,916.

CLEVELAND, OHIO.—Bids are asked until 11 a. m., Sept. 12, by the County Commissioners for grading, draining and improving a portion of River road. William F. Black is Clk.

CINCINNATI, OHIO.—Bids are asked until noon, Sept. 11, by the County Commissioners for spreading gravel on a portion of the Mount Hope road. Fred Dreihs is Clk.

MUNCIE, IND.—Bids are asked until Sept. 8, by the city, for resurfacing streets with brick. Estimated cost, $8,000. John A. Jackson is City Clk. John O. Potter is City Engr.

CORYDON, IND.—Bids are asked by the Commissioners of Harrison County until 2 p. m., Sept. 8, for the construction of a gravel or macadamized road. Frank E. Watson is County Audr.

ROCKVILLE, IND.—Bids are asked by the Commissioners of Parke County until 1.30 p. m., Sept. 8, for the construction of a gravel road in Washington Township and two gravel roads in Raccoon Township. H. A. Henderson is County Audr.

MARTINSVILLE, IND.—Bids are asked by the Commissioners of Morgan County until 2 p. m., Sept. 8, for the construction of 8,064 ft. of gravel road in Brown Township; 11,575 ft. of gravel road in Brown and Lewis Townships, and .8011 of a mile of gravel road in Lewis Township. B. E. Thornburg is County Audr.

HUNTINGTON, IND.—Bids are asked by the Commissioners of Huntington and Whitley Counties until 2 p. m., Sept. 18, for the construction of 15,432 ft. of gravel road on the line between the counties, the grade of the road to be 22 ft. in width. John W. Weaver is County Audr.

BLOOMINGTON, IND.—Bids are asked by the Board of Commissioners of Monroe County until 2 p. m., Sept. 9, for the construction of a macadamized road in Van Buren Township. Samuel M. Kerr is County Audr.

*MUSKEGON, MICH.—Bids are asked until noon, Sept. 8, at the office of B. H. Tellman, City Audr., for paving portions of First St. and Miller Ave.

CHICAGO, ILL.—At a recent meeting of the Board of South Park Commissioners, it was ordered that Michigan Ave., between Twelfth St. and Jackson Boulevard, be widened to a total of 130 feet, the driveway being 75 feet. The length of the street thus widened is about three-fourths of a mile, and it will require about 35,000 yds. of street paving, which may be asphalt, bitulithic, or creosoted blocks. There will also be about 182,000 sq. ft. of granite topped concrete sidewalk pavement. This will be an entire reconstruction of the street surface and the sidewalks, making, it is said, one of the finest pieces of work of this class in the country. Special study will be made of the kind of street lighting, etc., most suitable to such an improvement. Monumental flower vases may be used along the street.

MEXICO, MO.—Bids were received on Aug. 17 by the city for the construction of 25,103.2 sq. yds. brick pavement as follows: C. P. Werner, Sedalia, Mo., $1.62; B. A. Powell, Mexico, $1.44; D. C. OWENS, Mexico, $1.40 (awarded contract). For 14,321 ft. of concrete curb (1:3:5 and 6-in. × 22-in.): C. P. Werner, 42 cts.; B. A. Powell, 40 cts.; D. C. OWENS, 35 cts. (awarded contract). The pavement has a 6-in. broken stone base made in two layers, the first four inches of 2-in. stone (run of the crusher), the second two inches of 1¼-in. stone (run of the crusher), rolled with a 5-ton one-wheel roller. Two-inch sand cushion and "Diamond Block" bricks. L. L. Winans is City Engr.

VAN BUREN, ARK.—The city has awarded the contract to W. R. PETTY, Pine Bluff, Ark., at $20,105, for paving Main St. with brick on a concrete base. T. A. Bayley, Fort Smith, Ark., is Engr.

HOUSTON, TEX.—The city has awarded the contract at $15,006, to W. S. HIPP, Houston, for paving the Hardy St. road with crushed rock.

SNYDER, TEX.—The Commissioners of Scurry County voted $70,000 of bonds for the construction of roads and bridges.

BELLINGHAM, WASH.—CHARLES E. LIND has been awarded the contract for improving Potter St., between Ellis and James Sts., by paving with asphalt, at $19,351 by the Board of Public Works. Only two bids were received, the other being that of Riddle & Kavanagh, at $19,420.

SALT LAKE CITY, UTAH.—We are officially advised that all bids for paving in Paving Extension No. 18 were rejected on Aug. 14 by the Board of Public Works. The bids follow: (A) abutters' portion, (B) city's portion: J. D. Hanley (A) $13,137, (B) $21,240; P. J. Moran (A) $12,009, (B) $18,433; J. W. Mellen (A) $10,094, (B) $14,971. Louis C. Kelsey is City Engr.

LEWISTON, IDAHO.—Bids are asked until 8 p. m., Sept. 4, by the city, for the construction of 54,000 sq. yds. of hard surface pavement, combined curbs and gutters. John E. Nickerson is City Clk.

PETROLEA, ONT.—Bids are asked until 6 p. m., Aug. 31, by J. McHattie, Town Clk., for about 6,000 sq. yds. of vitrified brick pavement, with cement curb, on Main St. C. A. Jones is Town Engr.

PORTLAND, ORE.—See under Miscellaneous Contracts—"Municipal Improvements."

CALGARY, ALTA.—The contract for street paving has been awarded to the KETTLE RIVER QUARRY CO. The bids were as follows: The Bitulithic Co., $127,485; extra work, $2.98 per sq. yds. for street paving; single track lin. ft., $6; double, $12; excavation, per sq. yd., 60 cts.; combined curb and gutter, per lin. ft., $1; for creosoted block pavement, the Kettle River Quarry Co., $135,000; extra work, street or side paving, per sq. yd., $3.48; double track, including paving, $12.50 per lin. ft.; single track, $6.25; excavation, per cu. yd., 60 cts.; combined curb and gutter, per lin. ft., 75 cts. J. C. McNeill, for California asphalt, $115,000; extra concrete, per cu. yd., $7; asphalt concrete, per sq. yd., $3; excavation, per cu. yd., 75 cts.; railway cedar ties, 70 cts.; for Worswick asphalt, $110,000; extra work, concrete, per cu. yd., $7; asphalt concrete, per yd., $3; excavation, 75 cts.; railway cedar ties, 70 cts.; John Gunn & Sons, for carbolineum paving blocks, 10-yr. guarantee, $146,500.

REGINA, SASK.—Bids are asked for the construction of grade across Reed Lake, south of Morse, east of Section 4, Township 17, and east of Section 33, Township 16, all Range 8, until 4.30 p. m., Aug. 31. About 20,000 cu. yds. of earth fill will be required to be made. F. J. Robinson is Deputy Comr., Dept. Pub. Wks.

MANUFACTURING PLANTS.

(* *denotes that this work is advertised in Engineering News.*)

SPRINGFIELD, MASS.—It is stated that the Boston & Albany R. R. intends to construct a roundhouse at West Springfield, to cost $125,000. The proposed roundhouse will contain 70 stalls, will be of brick and the pits will be of concrete. [illegible] Shepard, Boston, Mass., is Ch. Engr. [illegible] Deems, Grand Central Station, New York, is Gen. Supt. of Motive Power.

NEW HAVEN, CONN.—The N[illegible] Fabric Corporation, Allington, has awarded to the TRACY BROS. CO., West Main [illegible], Waterbury, the general contract for the erection of a new factory building at Allingtown. The structure will be of brick, 68 × [illegible] ft., and will be two stories high. The general contractors will sublet a part of the work.

NEW BRITAIN, CONN.—The Stanley Rule & Level Co., New Britain Conn., has completed plans for a brick factory building, three stories and basement, of heavy mill, slow burning construction. The walls will be heavy enough to permit of raising the building several stories when desired. The structure will be used mainly for storage purposes, and neither power nor elevator will be installed. A steel bridge will connect with the present factory.

NIAGARA FALLS, N. Y.—The statement, published on Aug. 13, that the Carter-Crume Co. will receive bids this month for an addition to its factory on Highland Ave., to cost approximately $40,000," is erroneous.

SCHENECTADY, N. Y.—The W. W. Dutton Co., of this city, has bought a lot 66 × 180 ft. at the corner of State and Martin Sts. from the Flint Granite Company of Albany. The company will begin construction at once of a plant for manufacturing marble and granite monuments on the lot above mentioned, which is 66 ft. on State St. and 160 ft. on Martin St. The building to be erected will be 64 × 26 ft., and will contain an office, drafting room, show room, cutting and polishing room and a blacksmith shop. For the present the company's offices are located at 412 State St., with works at 8 Catherine St.

BUFFALO, N. Y.—The E. J. Jones Co., Military Road, manufacturers of steel balls, will rebuild upon a larger scale its plant on the Military Road and New York Central tracks, North Buffalo, which was partially destroyed by fire recently. Work on the new power-house will be commenced at once. H. G. Stoner is Mgr.

PHILADELPHIA, PA.—Stearn & Castor, Archs., Stephen Girard Bldg., have prepared plans and invited bids for alterations and additions to a 2-story factory at 3631 North Smedley St., for A. Mecky Co.

McKEESPORT, PA.—The National Tube Co. will erect a blooming mill with engines and complete equipment for rolling blooms for the pipe works here. The contract has been awarded to the MACINTOSH & HEMPHILL CO., of Pittsburg, and work will be started at once. The addition will increase the capacity of the plant and will give employment to 200 additional workmen.

FRISCO (Ellwood City post-office), PA.—The Frisco Iron & Steel Co., a newly organized manufacturing firm, has decided to locate its plant at Frisco. A site has been secured and work of excavating for the foundation will be started at once. The main building will be 150 × 250 ft. The manufacture of tubing from old waste iron will be the chief industry.

POTTSTOWN, PA.—The contract for the building of the Wilbraham-Green plant, in the Sixth Ward, has been awarded to FREDERICK H. KEISER, of this city. The building must be finished by Oct. 15. The main building will be 80 × 150 ft. Near the main building will be erected another building, 37 × 50 ft., and an engine-house. L. F. SHOEMAKER will do the structural iron work.

CUMBERLAND, MD.—The Deal Milling Co. will rebuild flour mill lately destroyed by fire. The new building will be fireproof. Cost, about $12,000; cost of machinery, $100,000.

BALTIMORE, MD.—The Baltimore Retort & Fire Brick Co. will rebuild plant recently burned at a loss of about $100,000. The new buildings will be one story high, covering three acres, and of concrete or sheet iron construction. L. N. Rancke is Gen. Mgr., Hull and Nicholson Sts.

FOLLANSBEE, W. VA.—D. J. Sinclair, of Steubenville, Ohio, is at the head of a syndicate of capitalists who have taken an option on the Davidson property here, and who propose the erection of a plant for the manufacture of steel tanks for water, oil, etc. No plans for the erection of the plant have been prepared as yet. About 1,000 men will be employed.

MOUNDSVILLE, W. VA.—The Indian Creek Brick Co., recently organized in this city, has engaged Alexander Purdy, of Moundsville, to prepare plans for the buildings and sidings for the plant that will be erected here at once. The site has been secured, and the contract for the grading awarded to R. J. McFADDEN, of this city. Contracts for the buildings and equipment will be awarded as soon as the plans are ready. The plant will cost $125,000, and will employ 200 men. Building and paving brick will be manufactured. Next summer an addition for manufacturing tile will be erected. T. B. Jennings, New York, is at the head of the company.

MARION, S. C.—The Marion Knitting Mills Co., of Marion, N. C., which has been incorporated with $100,000 capital stock, will establish its proposed plant at once. Organization will be effected with W. W. Neal, Pres., and S. H. Yancey, Secy.-Treas. The

company will [illegible]tall 30 knitting machines and accompan[illegible]nt for manufacturing hosiery. It will [illegible] a gasoline engine for furnishing the po[illegible] required. A building will be arranged [illegible] The plant will employ 25 operatives at [illegible] and be increased as the demand for the product makes it advisable.

WALHALLA, [illegible] C.—The management of the Oconee K[illegible]ng Mills, of Walhalla, S. C., has decid[illegible]n plans for enlarging the plant in acc[illegible]nce with a decision made some weeks [illegible] The company will provide for the insta[illegible]n of probably 100 knitting machines, w[illegible] will increase the equipment to 179 mac[illegible], with accompanying apparatus. It [illegible]ting an additional building to accomm[illegible] this equipment. The company recentl[illegible]reased its capital stock from $30,000 to $[illegible] in connection with this improvement.

SAVANNA[illegible] GA.—The Southern States Phosphate & Fertilizer Co. will rebuild milling plant and storage shed recently burned at loss of about $80,000. Frederick B. Pope is Pres., Augusta, Ga.

VALDOSTA, GA.—The Georgia & Florida Ry. Co. contemplates, it is reported, expending between $150,000 and $200,000 in erection of shops which, together with trackage, will cover about 30 acres. The location of the terminals has not been decided upon. E. L. Bemiss is Vice-Pres., Douglas, Ga.

TAMPA, FLA.—J. W. Roberts & Son are having plans prepared by Bonfoey & Elliott, 510 Curry Bldg., Tampa, for a cigar factory, 50 × 120 ft., to cost $28,000.

NEW ORLEANS, LA.—Daniel Schofield advises us that the plant of the Union Cotton Mills will be built this year at a cost of $250,000. The buildings will be two stories high and fireproof. No contracts have been let.

MEMPHIS, TENN.—A $250,000 plant for the manufacture of bridge and construction steel will be built in Memphis within the next three months by the Virginia Bridge & Iron Co., of Roanoke, Va. It will employ 250 men.

LOUISVILLE, KY.—Fred Erhart, Arch., Norton Bldg., has completed plans for a 4-story factory building, 100 × 150 ft., for Louisville Cotton Oil Co., Floyd and K Sts. Cost, $40,000.

The Independent Pole & Shaft Co., lately organized at Louisville, Ky., will take out a building permit at once for the erection for a factory at 14th and Hill Sts. The organizer of the company is C. H. Lambert, of Huntingburg, Ind.

HAMILTON, OHIO.—George Semler, of Seven Mile, Ohio, and Charles Dienfenbach will carry on a flour milling business under the name of the Prince Milling Co. A plot of ground on North B St., north of the Semler mill, 105 ft. frontage, has been purchased and a 100-bbl. flour mill will be erected thereon. The plans for the mill have been completed and the contract will be let at once for the construction. It is expected to have the mill in operation in three months.

HAMMOND, IND.—The Hammond Machine & Forge Works Co. has been incorporated to construct and equip a factory and forge plant. Charles H. Luthman, Peter Moser and Daniel Bruhn are Directors.

STINESVILLE, IND.—The Gary Steel Co. has completed the survey of a site in this town upon which to construct a steel mill and 40 houses.

DETROIT, MICH.—Chauncey E. York, Warriorsmark, Pa., has bought a half block bounded by Second, Third and Bohemia Aves., Detroit, upon which he will erect a large factory to cost $80,000.

ISHPEMING, MICH.—A factory for the manufacture of dynamite is to be erected by the Pluto Powder Co. on lands a short distance from Ishpeming. It is expected the plant will be in commission the first of the coming year. It will give employment to 75 men.

CHICAGO, ILL.—Bauer & Black, 283 25th St., manufacturers of druggists' sundries, will erect an addition to their works on vacant land just purchased from Martin Roche, 200 × 108 ft., at the corner of Dearborn and 25th Sts.

WICHITA, KAN.—W. G. Charles, Arch., Winne Bldg., Wichita, has let general contract to WURSTER CONSTRUCTION CO., Murdock Bldg., for a 2-story factory building for Mentholatum Co., A. A. Hyde, Mgr. Cost, $30,000.

M. P. Paret, Ch. Engr., U. S. & Mexican Trust Bldg., Kansas City, Mo., is preparing plans for a brick 21-stall roundhouse, a brick machine, blacksmith and erecting shop, 153 × 334 ft., a brick power-house, 85 × 90 ft., and a brick transfer stable, coach, tank and carpenter shop, 120 × 200 ft., at Wichita, for the Kansas City, Mexico & Orient Ry. Co., Kansas City, Mo.

SALINA, KAN.—A building permit was issued to the Salina Foundry & Mfg. Co., of Salina, to build a cement building on North Fourth St. The building will be completed within 60 days. The building will be 52 × 112 ft. in size and will be two stories in height. H. J. Lorson, Salina, is Mgr.

LITTLE ROCK, ARK.—H. H. Walsh, Pres. of the Georgia Bagging & Tie Co., of Augusta, Ga., contemplates establishing a branch plant in this city. It has not been definitely decided as yet to establish the mill, but affirmative action will probably be taken soon. It is proposed to invest from $60,000 to $80,000 for the equipment of a plant to produce 120 rolls of bagging every day.

HOUSTON, TEX.—E. H. Holliday, of Knoxville, Tenn., contemplates establishing a stove foundry in Houston with a capacity of 30 stoves and two tons of miscellaneous castings. The machinery is to be operated by a 25-HP. gasoline engine. Total investment, about $25,000.

DOUCETTE, TEX.—The Thompson Bros. Lumber Co. has had plans prepared by F. A. Badstubener, Doucette, for a double band mill. Daily capacity, 100,000 ft. Cost, $80,000.

EDMONDS, WASH.—G. Larsen, Supt. of the Weatherproof Shingle Co. states that he will build a shingle mill within a few miles of Edmonds, to be controlled by himself and friends.

SEATTLE, WASH.—The Index-Galena Co. has bought the shingle mill owned by the Index Logging & Lumber Co., and will construct a sawmill east of the shingle mill.

BURNS, ORE.—M. L. Lewis, Gen. Mgr. of the Oregon Industrial Co., Burns, writes us that a company is beeing organized at this town for the purpose of erecting a 100-bbl. flouring mill plant. The power is to be electric, and will be transmitted about six miles. He desires to communicate with parties having machinery of that kind for sale, as well as consulting and designing engineers. All inquiries may be addressed to Mr. Lewis at Burns, Ore.

GRANBY, QUE.—The BIRMINGHAM IRON WORKS have been awarded the contract for machinery to equip the first unit of the rubber mills which S. H. C. MINER is building. The order amounts to about $50,000, and the machinery is to be delivered as fast as the buildings are ready to receive it. Mr. Miner is consulting with engineers for the installation of the electrical equipment for the works.

MISCELLANEOUS CONTRACTS.

(* *denotes that this work is advertised in Engineering News.*)

U. S. RECLAMATION SERVICE.—Items regarding irrigation, canal projects, etc., will be found under Water-Supply—Irrigation.

---

*DREDGING.—Norfolk, Va.—Bids are asked until noon, Sept. 14, by Maj. Jos. E. Kuhn, Corps Engrs., U. S. A., for dredging in Hampton Roads, Va.

GRAVEL.—New York, N. Y.—Bids are asked until 3 p. m., Sept. 3, for furnishing and delivering 7,000 cu. yds. of Roa Hook gravel or gravel of equal quality.

DREDGING.—Evansville, Ind.—Bids are asked by Col. Wm. T. Rossell, Corps Engrs., U. S. A., Cincinnati, Ohio, until 2 p. m., Aug. 31, for dredging harbor at Evansville.

PILES.—Washington, D. C.—Bids are asked by Maj. Spencer Cosby, Corps, Engrs., U. S. A., until noon, Sept. 9, for furnishing and delivering piles on Pamunkey River, Va.

CREOSOTED BARGES.—Memphis, Tenn.—Bids are asked by Capt. Wm D. Connor, Corps Engrs., U. S. A., until noon, Sept. 7, for furnishing three creosoted barges.

EXTERMINATING BEETLES.—Warwick, R. I.—Steps are being taken toward the extermination of the elm beetle. Robt. W. Greene is City Engr.; James T. Lockwood is City Clk.

LUMBER.—Washington, D. C.—Bids are asked by Maj. Spencer Cosby, Corps Engrs., U. S. A., Washington, until noon, Sept. 9, for furnishing and delivering lumber on York River, Va.

CEMENT, SAND.—New York, N. Y.—Bids are asked by the Department of Parks until 3 p. m., Sept. 3, for furnishing and delivering 500 bbls of Portland cement, 300 cu. yds. of Cow Bay sand.

DAM.—Port Arthur, Ont.—Bids will be received by J. McTegue, City Clk., until Aug. 29, for constructing a concrete dam at Onion Lake, on Current River. Engineers, Smith, Kerry & Chace, of Toronto.

WOODEN WHARF.—Fort Sumter, S. C.—Bids are asked by Jos. T. Davidson, Q. M., Fort Moultrie, S. C., until noon, Sept. 14, for constructing wooden wharf and approach at Fort Sumter.

MOTOR TRUCKS.—Washington, D. C.—Bids are asked by the District Commissioners until noon, Sept. 5, for furnishing two motor trucks, equipped with air cooled gasoline engines.

TOWBOAT—Cincinnati, Ohio.—Bids are asked by Lieut.-Col. J. G. Warren, Corps Engrs., U. S. A., until 2 p. m., Sept. 9, for building a wooden hull towboat with snagging appliances.

LOCK GATES—Winnipeg, Man.—Bids are asked by the Department of Public Works, Ottawa, until 4 p. m., Sept. 14, for the construction of lock gates at St. Andrew's Rapids, Red River, Man.

*LIGHTHOUSE FOUNDATION.—Wilmington, Del.—Bids are asked until 11 a. m., Sept. 10, by the Lighthouse Engineer for erecting the foundation for the lighthouse at Miah Maul Shoal Light-Station, Delaware Bay, N. J.

CONCRETE DAM.—Cincinnati, Ohio.—Bids are asked by Col. Wm. T. Rossell, Corps Engrs., U. S. A., until 2 p. m., Sept. 10, for constructing dam of concrete, etc., at head of Browns Island, Ohio River.

BRICK TUNNEL.—Buffalo, N. Y.—Bids will be received until Sept. 1 by Francis G. Ward, Comr. Public Works, for constructing two brick tunnels under the tracks of the N. Y. C. & H. R. R. R., near the north end of the pumping station, Bureau of Water.

DREDGING.—Wapakoneta, Ohio.—Bids will be received until Aug. 28 for the improvement of Auglaize River through this city, to cost about $10,000. Work is to include dredging and constructing a dam below the city. C. W. Williamson, of Wapakoneta, is Engr.

VACUUM SYSTEM.—Harrisburg, Pa.—Bids will be received at the office of Samuel B. Rambo, Supt. of Public Grounds and Buildings, until Sept. 8, for installation of a vacuum and coupressed air cleaning system in the State Capitol and State Library Museum.

PIERS.—Baltimore, Md.—Bids were received Aug. 12 by the Board of Awards, for constructing two pile and timber piers, known as Piers 7 and 8. Contract has been awarded to SANFORD & BROOKS CO., 15 South St., at $49,216. The same company is now engaged in the construction of Piers 4, 5 and 6.

LEVEE, ETC.—Memphis, Tenn.—Bids are wanted until Sept. 16 for constructing about 1,135,000 cu. yds. levee work, to consist of about 800,000 cu. yds. new levee work and 335,000 cu. yds. of enlargement work. Address B. G. Covington, Ch. Engr., St. Francis Levee Bd., 168 Randolph Bldg., Memphis, Tenn.

TELEPHONE SYSTEM.—Virden, Man.—Bids will be received by A. P. Power, Secy.-Treas., until Aug. 31st for the construction of a telephone system for the rural municipality of Pipestone. Plans may be seen at office of Secy.-Treas., Virden, or at the Department of Telephones and Telegraphs, Winnipeg.

CONCRETE WALL, CANAL.—Montreal, Que.—Bids are asked until 4 p. m., Aug. 31, for concrete walls and widening of the Lachine Canal. Plans and specifications can be seen at the office of the Superintending Engineer of the Quebec Canals, No. 2 Place d'Armes, Montreal. L. K. Jones, Secy., Dept. of Railways and Canals.

HULL, SCOWS.—Ottawa, Ont.—Bids are asked by R. C. Desroches, Asst. Secy., Dept. Public Works, until 4 p. m., Sept. 3, for the construction of a wooden hull for a 1-cu. yd. dipper dredge. Plans and specifications may be seen at the office of A. R. Dufresne, Resident Engr., Winnipeg; Z. Malhoit, Resident Engr., Calgary, Alta., and also at the Department of Public Works, for the construction of two side-hopper scows of 32 cu. yds. capacity.

*ABUTMENT.—Wheeling, W. Va.—Bids were received as follows on Aug. 10 by Capt. F. W. Altstaetter, Corps Engrs., U. S. A., Wheeling, for constructing the abutment for Dam No. 19, Ohio River: Preston P. Curtis and M. H. Shumway, of Portsmouth, Ohio, $18,094; Pennsylvania Construction Co., Pittsburg, Pa., $19,366; Ohio River Construction Co., Evansville, Ind., $18,991.

REPAIRING FENCES.—New York, N. Y.—Bids are asked by the Department of Parks until 3 p. m., Sept. 3, for all the labor and materials required for repairing the cast and wrought iron fences inclosing Stuyvesant Park, Bryant Park and the grass plots in Park Ave., from 34th St. to 40th St., and from 56th St. to 96th St., Boro. of Manhattan.

YELLOW PINE.—Leavenworth, Kan.—Bids will be received by the Department of Justice, Office of R. V. LaDow, Supt. of Prisons and Prisoners, Washington, D. C., until Sept. 2, for furnishing and delivering at the U. S. Penitentiary, Leavenworth, Kan., 30,000 ft. common white pine, 12,000 ft. common yellow pine, and 1,075 pieces short leaf yellow pine of various sizes.

*PIER AND SHED.—San Francisco, Cal.—Conrtact has been awarded by the Board of State Harbor Commissioners to ROBERT WAKEFIELD, of Portland, Ore., for furnishing the labor and materials (except cement, creosoted mooring piles, and track rails with fish plates) and for the construction of a pier and shed over same, to be known as Pier No. 40, on the waterfront between King and Townsend Sts., at $302,400.

HOIST TOWER.—Atlanta, Ga.—Bids are asked by R. V. LaDow, Supt. of Prisons and Prisoners, Washington, D. C., until Sept. 2, for furnishing and delivering at U. S. Penitentiary, Atlanta, Ga., (a) steel rails, fittings and spikes, to be used under hoist tower; (b) boom derrick fittings to be used on hoist tower; (c) iron and steel work, including flanged wheels and bearings under same, to be used in erection of hoist tower.

DRAINAGE.—Piggott, Ark.—Bids were received on Aug. 20 for constructing Clay County District No. 5, including main ditch, laterals and sub-laterals. J. D. Mitchell, Engr., Greenway, Ark. Contracts were awarded to J. S. SIMPSON and I. C. LEGGITT, of Rector, Ark., as follows: Main ditch (six miles, 200,000 cu. yds.), at 9.34 cts. a cu. yd.; laterals (five miles, 50,000 cu. yds.), at 20 cts. a cu. yd. Main ditch is dredge work and laterals are team work.

DITCHES.—Fulton, Ill.—Bids were received on Aug. 12 by the Commissioners of the Cattail Drainage District, Fulton, for the construction of the proposed ditches of said Drainage District, requiring the removal of approximately 300,158 cu. yds. of material. W. F. Sears, Prophetstown, Ill., is Engr. Lowest bidders were G. A. McWilliams, Walnut, Ill., 5.3 cts. and 7 cts. per cu. yd.; A. R. Putnam, 6.195 cts.; T. McKillip, Maquoketa, Iowa, 6.2 cts.

BROKEN STONE.—New York, N. Y.—Bids were received as follows by the President of the Borough of Richmond, New Brighton, N. Y., on Aug. 18, for furnishing and delivering 5,000 tons of 1½-in. and ¾-in. broken stone and screenings of trap rock or Staten Island syenite in stone delivery district No. 3: Wm. J. Quinlan, Port Richmond, S. I., $1.61; Jos. Johnson Sons, 193 West New Brighton, S. I., $1.88; Thomas Carlin, West New Brighton, S. I., $1.94; Manhattan Trap Rock Co., 114 Liberty St., New York, $1.73.

PILE DAMS.—New Orleans, La.—Bids were received as follows on Aug. 10 by Col. E. H. Ruffner, Corps Engrs., U. S. A., New Orleans, for furnishing plant, labor and material and constructing sheet pile dams in outlet bayous of Southwest Pass, Mississippi River (bidders of New Orleans unless otherwise stated): Doullat & Williams, 213 Macheca Bldg., $74,340; Constantin, Riess & Guerin, Hibernia Bldg., $68,918; Richard M. Murphy, 301 North Front St., $48,626; Peter Eskald, Biloxi, Miss., $47,300.

DREDGING.—New Orleans, La.—Bids are asked by Lieut. W. Willing, Corps Engrs., U. S. A., until 11 a. m., Sept. 8, for dredging about 900,000 cu. yds., in two lots, between Vermillion Bay and Mermentan River, La., in connection with constructon of intercostal canal in Louisiana; about 9½ miles long; 70 ft. wide at top, 5 ft. deep at mean low-water level; double width for 1,000 ft. every mile apart. H. L. Gueydan, Chn., of Louisiana Executive Committee of Interstate Inland Waterway League.

*DRAINAGE.—Houston, Tex.—Bids are asked until 2 p. m., Sept. 5, by the South End Land Co., Houston, for the construction of about seven miles lateral ditch, with bottom width of 4 ft. and 1¾ miles of main ditch with bottom width of from 4 ft. to 14 ft., all ditches ranging from 5 to 7 ft. deep, the total work being approximately 150,000 cu. yds. of excavation. For copy of the specifications and full information address F. L. Dormant, C. E., Kiam Bldg., Houston, Tex., or Harman Engineering Co., Peoria, Ill.

CONDUIT.—Boston, Mass.—Bids were received as follows on Aug. 10 by Guy C. Emerson, Supt. of Streets, Boston, for Stony Brook conduit in Meehan St. and Private land Section 5, West Roxbury: Falvey & Kelley, $134,154; T. J. Young Co., $111,331; W. J. Bary, $115,189; Donovan & Phillips, $137,310; Bruno & Petitti, $102,457; Hugh Nawn Cont. Co., $113,325; Anthony Cepalo, $109,027; Metropolitan Cont. Co., $113,599; Jones & Meehan, $109,651; COUGHLIN & SHEILS CO., 104 Hanover St., Boston, $102,200 (awarded contract).

*DREDGING.—Trenton, N. J.—Bids were received as follows by Harry Schneider, Comr. Inland Waterways, Trenton, on Aug. 18, for dredging a section of the proposed inland waterway from Cape May to Bay Head, N. J., near the former place: Hill Dredging Co., Pleasantville, N. J., 13¾ cts.; Atlantic Dredging Co., Philadelphia, Pa., 12½ cts.; Rickards Dredging Co., Philadelphia, Pa., 9 4-10 cts.; Miner Engineering Co., Washington, D. C., 13 cts.; Ottens Dredging Co., Ottens, N. J., 13¼ cts.; American Dredging Co., Philadelphia, 8 1-5 cts; Atlantic, Gulf & Pacific Co., New York, 15.98 cts.

DRAINAGE.—Hartford, Conn.—The Board of Contract and Supply has awarded the contract for constructing a drainage system in the south meadows to the EDWARD BALF CO., Hartford, for 37 cts. per cu. yd. for earth and $3 per cu. yd. for rock. The contract calls for 20,000 lin. ft. of excavation. Other bidders were: Angelo D'Ambrosio, Hartford, $2; Evelin Bros., New Britain, 55 cents.; A. B. Griswold, New Britain, 75 cts.; A. W. Byrne, Boston, 58 cts.; John M. Ferrante, Hartford, 58 cts.; Thos. A. Nolan, Hartford, 54 cts.; Charles H. Slocum, Hartford, 45 cts.; Reese B. Davis, Hartford, 62 cts.

WHARF.—Fort Adams, R. I.—Bids were received as follows by Capt. Willis C. Metcalf, Q. M., U. S. A., Newport, on Aug 18 for alteration and construction of an addition to wharf known as North Dock at Fort Adams: Roy H. Beattie, 57 North Main St., Fall River, Mass., $11,456; time of completion, five months; Joseph C. Terry, Fall River, Mass., $14,600; four months. Darling & Slade, 56 North Main St., Fall River, Mass., $13,440; 120 days. General Contract Co., New Orleans, La., $15,380; five months. John J. Fitzpatrick, 27 Hamilton St., Plattsburg, N. Y., $23,600; May 15, 1909. The T. A. Scott Co., Inc., New London, Conn., $27,000; 150 days.

DREDGING.—Oakland, Cal.—Bids were received as follows by Lieut.-Col. John Biddle, Corps Engrs., U. S. A., Chronicle Bldg., San Francisco, on Aug. 14, for dredging in Oakland Harbor (bidders all of San Francisco): (a) price per cu. yd.; (b) Section A, total for 629,400 cu. yds.; (c) Section B, total for 1,138,700 cu. yds.: Pacific Coast Dredging & Reclamation Co., 6 East St., (a) 18 cts., (b) $113,292, (c) $204,966; C. H. Gish, 1682 San Jose Ave., (a) 18½ cts., (b) $116,439, (c) $210,659; Nicholas R. Harris, 95 Market St., (a) 29¾ cts., (b) $187,246, (c) $338,763; North American Dredging Co., Merchants Exchange Bldg., (a) 32½ cts. (b) $204,555, (c) $370,077.

*CEMENT.—Chicago, Ill.—Bids were received as follows at the office of the United States Reclamation Service, Federal Bldg., Chicago, Ill., on Aug. 12 for furnishing 5,000 bbls. of Portland cement, f. o. b. cars at the works of the bidder: Ideal Portland Cement Co., Denver, Colo., $1.22 per bbl. when for Colorado points, $1.13 when for Wyoming points, $1 for other points (f. o. b. Portland, Colo.); Iola Portland Cement Co., Iola, Kan., 64 cts., f. o. b. Iola, Kan.; Western States Portland Cement Co., Independence, Kan., 75 cts., f. o. b. Independence, Kan.; Pacific Portland Cement Co., San Francisco, Cal., $1.40, f. o. b. Cement Solano Co., Cal.; Leroy Gough, Washington, D. C., $1.295, f. o. b. Alsen on Hudson, N. Y.; Dewey Portland Cement Co., Kansas City, Mo., 90 cts., f. o. b. Dewey, Okla.; Universal Portland Cement Co., Chicago, Ill., 85 cts., f. o. b. S. Chicago, Ill.; Union Portland Cement Co., Ogden, Utah, $1.10 when for Utah and Wyoming ponts, $1.30 when for Idaho and Nevada points, f. o. b. Devil's Slide, Utah; Marquette Cement Mfg. Co., Chicago, Ill., 90 cts., f. o. b. La Salle, Ill.; Atlas Portland Cement Co., New York, N. Y., 75 cts., f. o. b. Hannibal, Mo.; United Kansas Portland Cement Co., Iola, Kan., 80 cts., f. o. b. Iola, Gas, Independence, Kan.

MUNICIPAL IMPROVEMENTS.—Portland, Ore.—Mayor Harry Lane advises us that the following construction work is planned for next year: A system of boulevards, parks, playgrounds, bridges over the river, many miles of street improvements, public docks, a new and enlarged pipe-line from the head works of this city, 40 miles in length, with a capacity of 40,000,000 gallons per day; a new fireboat, a system of dry mains from the water front back into the heart of the city, to be used by the fireboat in case of fire in business center. The issuance of bonds for the purpose of putting in such improvements as are here enumerated will amount to $5,000,000. The city is growing rapidly, and the necessary improvements due to such growth will involve an expenditure of perhaps several million dollars additional. Many miles of street and other permanent improvements for such ordinary purposes as constructing steel bridges across gulches and ravines about the city, and the construction of streets and sewers, many miles of which are contemplated, will necessitate an expenditure of several million dollars in addition. Many miles of water mains will also be constructed throughout the city for reinforcing the system as it now exists. This work will be let by contract. For details concerning these improvements address D. W. Taylor, City Engr.

U. S. POSSESSIONS AND CUBA.

LUMBER.—Panama.—The Isthmian Canal Commission, Washington, D. C., has awarded contract to W. R. GRACE & CO., 1 Hanover Sq., New York, for furnishing 1,277 creosoted piles at $21,743, 1,107 pieces of creosoted lumber at $7,463, and 2,782 pieces of untreated lumber at $2,700. The material is Douglas fir and the delivery at La Boca.

CEMENT.—Panama.—The Isthmian Canal Commission has awarded contract for 4,500,000 bbls. of Portland cement to the ATLAS PORTLAND CEMENT CO., 30 Broad St., New York. Bids were received on June 1 and complete list of bids was given on June 4. The bid of the Atlas Co. was as follows: For the entire supply, delivered during four years, on dock, within reach ship's tackle, at United States port: Jersey City of Hoboken, $1.19 in bbls.; $1.60 in double duck bags; 65 cts. at works, Northampton, Pa., Government to furnish bags or bbls.

SEWERAGE, PAVING.—Havana, Cuba.—We are officially advised that "a contract has been entered into between the Republic of Cuba and the McGIVNEY & ROKEBY CONSTRUCTION CO., 1 Broadway, New York, whereby the McGivney & Rokeby Construction Co. agreed with the Republic of Cuba to carry out the original contract made between the City of Havana and Ralph T. Rokeby and Samuel P. McGivney on Jan. 10, 1902, pursuant to the orders of the Wood Administration, this second contract being made with the Republic of Cuba pursuant to the order of the President, Hon. Theodore Roosevelt, pursuant to advisory letters of Hon. William H. Taft, Secy. of War, and Hon. Elihu Root, Secy. of State. The contract requires the beginning of the work within 90 days, and in carrying out the contract the McGivney & Rokeby Construction Co. has made arrangements whereby the sewer portion of the work is to be prosecuted by the CUBAN ENGINEERING & CONTRACTING CO., a corporation just organized, and the paving portion of the work is to be carried on by the UVALDE ASPHALT PAVING CO., 1 Broadway, New York. Samuel Bettle is Chn. of the United Engineering & Contracting Co., and Pres. of the Cuban Engineering & Contracting Co. D. L. Hough is Pres. of the United Engineering & Contracting Co. and Managing Director of the Cuban Engineering & Contracting Co., 32 East 33d St., New York. William H. Schmidt is Treas. of both companies. Arrangements have been made for a force of engineers to proceed at once to Havana, and work will be begun on the contract in the next fortnight. Ralph T. Rokeby is Pres. of the Uvalde Asphalt Paving Co. Negotiations extending over a month have just ended in the signing of the contracts, R. Floyd Clarke, of 37 Wall St., New York, acting as Counsel for the McGivney & Rokeby Construction Co., and Charles K. Beekman, of Philbin, Beekman & Menken, 52 William St., New York, as Counsel for the Cuban Engineering & Contracting Co."

INDUSTRIAL NOTES.

MacARTHUR BROTHERS CO., Chicago, Ill., announce the election of F. C. Hitchcock as Vice-President and General Manager of the company.

THE HAYES TRACK APPLIANCE CO., Geneva, N. Y., advises us that it has established a factory at Hamilton, Ont., to supply the demand for Hayes Derails in Canada.

THE G. DROUVE CO., of Bridgeport, Conn., and Chicago, has recently received the order for skylighting the new car barns of the Chicago City Railway Co., Chicago, Ill.

THE S. OBERMAYER CO., Cincinnati, Ohio, announces that it has opened a branch warehouse at Erie, Pa., for the supply of its foundry facings and foundry supplies. W. L. Scott is in charge.

THE SCHAEFER & BUDENBERG MFG. CO. announces that it has sold its factory buildings at Foxboro, Mass., and on Sept. 1, 1908, will move its main office, works and New York salesroom to 963-5 Kent Ave., Brooklyn, N. Y.

THE GAS POWER ENGINEERING CORPORATION announces that it has established offices in the Empire Bldg., Pittsburg, Pa. It also announces that it has secured the services of James K. Lyons, M. Am. Soc. C. E., and James B. Hardie.

THE NATIONAL MACHINE RECORDER CO., Marquette Building, Chicago, has been organized to introduce a machine which is installed in the office of manufacturing plants to record the times of starting and stopping individual tools or machinery. President, F. A. Cooney.

THE STONE & WEBSTER ENGINEERING CORPORATION, of Boston, has ordered from the Pennsylvania Steel Company 1,000 tons of high tee-rails for the Seattle Electric Company. These rails will be laid on streets which are being repaved, requiring the use of high rails.

THE CEMENT SECURITIES CO., of Denver, Colo., has appointed F. L. Smidth & Co., 41 Cortlandt St., New York, Consulting Engineers for the company. The Securities company controls Portland cement plants operating at Portland, Colo., and Devils Slide, Utah, and under construction at Three Forks, Mont., and El Paso, Tex.

THE WILSON-SNYDER CO., Pittsburg, Pa., states that S. B. Whinery, located at No. 95 Liberty St., New York City, has completed arrangements with the Wilson-Snyder Co. whereby he will represent them in New York and vicinity. Mr. Whinery will handle the full line of steam pumps and high-duty pumping engines built by this company.

THE STONE & WEBSTER ENGINEERING CORPORATION, Boston, Mass., has purchased from the Grays Harbor Commercial Co. about 2,000,000 feet of timber for building the cofferdam in the construction of the new 20,000-HP. Hauser Lake dam, which is to be erected for the United Missouri River Power Co. on the Missouri River near Helena.

CHARLES MEAD & CO., 299 Broadway, New York, have secured the contract for paving the Eastern Plaza of the Blackwell's Island Bridge, New York. This will require about 1,000,000 paving blocks. The specifications call for iron slag paving blocks, which are practically unknown in this country, but have been manufactured for a long time at Middlesbrough, England.

THE WISCONSIN ENGINE CO., Corliss, Wis., is now building a vertical triple-expansion pumping engine of the crank-and-fly-wheel type for the water-works system of Atlanta, Ga. It has a capacity of 20,000,000 gals. per 24 hours against a maximum head of 160 lbs., and is said to be the largest engine of its type in the Southern States. The steam cylinders are 33, 62 and 94 ins. diameter. The water plungers are 31-ins. diameter. All have the same stroke, 60-ins.

THE INDEPENDENT PNEUMATIC TOOL CO., Chicago, Ill., has appointed the firm of H. W. Petrie, Ltd., 131 Front St., West, Toronto, Ont., and 22 Victoria Sq., Montreal, Can., and Vancouver, B. C., as exclusive agents for the sale of the Thor pneumatic tools and appliances in the Dominion of Canada. The company mentioned will carry a complete stock of pneumatic tools and appliances in their various stores, and will therefore be able to make immediate delivery.

THE VICTOR PORTLAND CEMENT CO., Central Building, Los Angeles, Cal., is preparing to erect the first unit of its proposed plant at Victorville, as soon as funds are raised for building and operating this unit. The cost of this is estimated at $625,000. The cost of the complete plant, with a capacity of 3,000 barrels per day is estimated at $1,500,000. The deposits owned by this company will, it is said, make a white cement, and one which is specially adapted for use in marine work owing to its low percentage of alumina (about 2.64%). The President of the company is Francis H. D. Banks and the Secretary, Frederick H. Merrell.

THE WETHERILL BROS. MACHINE CO., Chester, Pa., has recently furnished to the U. S. Government the dredge "Dalecarlia," described as follows: Hull, 66 ft. long, 24 ft. beam, 6 ft. deep; boiler, water tube, 150 HP.; pump, 10-in. direct connected to 10 and 20 × 10-in. compound condensing engine; capacity, 1,000 yds. per day; excavate in 15 ft. of water. The company also announces the recent completion of the dredge "William Penn," with the following description: Hull, 85 ft. long, 23 ft. 10 ins. beam, 8 ft. deep; boiler, water tube, 200-HP.; pump 12-in. direct, connected to 12 and 22 × 14-in. compound condensing engine; capacity, 2,000 to 2,500 yds. per day; excavate in 30 ft. of water.

THE C. O. BARTLETT & SNOW CO., Cleveland, Ohio, reports the receipt of an order through F. C. Greene, Cleveland, Ohio, Coal Mining Engineer for the Crow's Nest Pass Coal Co., Fernie, B. C., for a complete steel tipple for the company's Michel mines. The tipple is to have a capacity for handling 6,000 tons coal per eight-hour day. A Greene Self-Dumping Car Haul will be installed, as well as other of the engineer's special appliances, together with special machinery manufactured by the Bartlett & Snow Co. Considerable of the machinery will be purchased in Canada, and work will be pushed to completion by the first of January, 1909. The plant is said to be of the largest capacity of any single tipple in North America.

THE YOUNGSTOWN SHEET & TUBE CO., Youngstown, Ohio, has contracted with Wm. B. Scaife & Sons Co., Pittsburg, Pa., for an addition to its present 15,000-HP. water softening and purifying system to provide for the 8,000-HP. boilers which are being added for the operation of the new blast furnaces. The present water softening and purifying system is of the We-Fu-Go Intermittent type, and consists of four large treating and settling tanks and four mechanical gravity filters. When the additional apparatus is installed, the system will consist of six large treating and settling tanks and seven mechanical gravity filters, and the total capacity will provide for 23,000-HP. boilers, of 92,000 gals. of water per hour. Some recent contracts taken by Wm. B. Scaife & Sons Co., of Pittsburg, are the following: Tennessee Coal, Iron & R. R. Co., 35,000-HP.; Shenango Furnace Co., 8-000-HP.; American Steel & Wire Co., 25,000-HP.; Woodward Iron Co., 10,800-HP.

THE PURIFICATION & ENGINEERING CO., with offices at 50 Church St., Hudson Terminal Buildings, New York City, recently incorporated under the laws of the State of New York, has taken up the manufacture of water softeners and filters, patents Reisert & Dervaux. The Hans Reisert Co., Ltd., of Cologne, Germany, is in possession of about 14 United States patents for water filtration and purification, and they have secured in the last three months, two new valuable patents. Several years ago, the Hans Reisert Co., of Cologne, Germany, began to introduce their apparatus in the United States, and there are at the present time about 24 plants in successful operation. The business of the Hans Reisert Co. has been conducted for nearly 14 years by Mr. Otto Buedinger, a mechanical engineer, who has made arrangements with the home office to conduct a business independently as the Purification & Engineering Co., with the following officers: Wilh. Baur, Pres.; Otto Buedinger, Vice-Pres. and Gen. Mgr.; L. M. Lawson, Jr., Secy. and Treas. The new company has published the pamphlet H_2O, the first issue of various catalogs which they intend to bring before the public, and which should be of interest to anybody contemplating the installation of a water-purification plant.

THE AMERICAN MANGANESE BRONZE CO., 99 John St., New York City, U. T. Hungerford, Pres., W. A. Locke, Secy. and Treas., announce the completion of its works at Holmesburg Junction, Philadelphia, on the New York division of the Pennsylvania Railroad. The buildings are of reinforced concrete and steel framework construction, with brick curtain walls, and consist of melting plant and foundry, metal storehouse, core shop and office, with complete chemical and testing laboratories, light and power plant and machine shop. The main building is equipped with a ten-ton Niles electric traveling crane, which, together with a one-ton electric hoist serves the entire plant. The plant is equipped with pneumatic tools for the cleaning of castings and its 600 feet of siding running the entire length of the plant insures economical handling of raw material and shipments. The products of the American Manganese Bronze Co. comprise ingots, billets, forgings, rods and sheets, together with both large and small castings, their facilities permitting them to supply bronze castings up to 20,000 lbs. each. In addition to their special Spare's Manganese Bronze, Spare's White Bronze and Spare's Hydraulic Bronze alloys, they also produce standard U. S. Government compositions and other high-grade alloys designed to meet the most severe engineering requirements.

TRADE PUBLICATIONS.

ELECTRIC FANS FOR FURNACES.—The Emerson Electric Mfg. Co., St. Louis, Mo. Paper; 7 × 10 ins.; pp. 8; illustrated.

This bulletin (No. 3306) relates to the use of electric fans as blowers for furnaces in heating and ventilating plants for residences or other buildings.

ELECTRIC-LIGHT FIXTURES.—Cleveland Gas & Electric Fixture Co., Cleveland, Ohio. Bulletin 1. Paper; 6 × 9 ins.; pp. 16; illustrated.

Their bulletin describes the features of a line of ceiling fixtures adapted for use with tungsten lamps and holophane shades.

DUMP BUCKETS FOR CONCRETING.—The Isley Iron Works, Indianapolis, Ind. Paper; 3¼ × 6 ins.; pp. 8; illustrated.

These steel buckets are fitted with valves by which the discharge of the concrete is regulated. The buckets are made in different shapes and sizes for different kinds of work.

TRACTION ENGINE POWER.—The Huber Mfg. Co., Marion, Ohio. Paper; 6 × 3½ ins.; illustrated.

This pamphlet shows the Huber contractor engine in use as a tractor of wagon trains and in roadmaking work. Commendatory letters are published from users of these engines.

REINFORCED CONCRETE.—Universal Unit System, 132 Nassau St., New York City. 9 × 6 ins.; pp. 15; illustrated.

This company makes certain shapes in the form of connections, separators, spacers and attachments, by means of which any contractor can build up his own unit system in the field.

For other Proposal Advertisements see pages 43, 44, 45, 46, 49, of Advertisements and Construction News page 80.

HEATING CONDUITS AND WATER MAINS.

Sturgeon Bay, Wis., Aug. 22, 1908.

Sealed proposals will be received by the City Clerk, of the City of Sturgeon Bay, Wis., up to 8 o'clock P. M., Sept. 7, 1908, for the furnishing material and installing a system of Heating conduits; also a system of Water Mains in the streets and alleys of the City of Sturgeon Bay, Wis.

Bids will be received upon the material f. o. b. cars Sturgeon Bay and for the installation of same separately, and also upon the work as a whole.

A certified check equal to 5 per cent. of the amount of the bid must accompany each proposal.

Plans and specifications are on file in the office of the City Clerk of Sturgeon Bay, Wis., and also at the office of A. T. Maltby, C. E., 803 Great Northern Bldg., Chicago, Ill.

H. C. LEONHARDT,
City Clerk.

ROAD IMPROVEMENT.

Mt. Kisco, N. Y.

Sealed proposals will be received by the Town Board of the Town of Bedford, Westchester Co., N. Y., at the office of Joseph E. Merriam, Town Clerk, in the Village of Mount Kisco, until 4 o'clock P. M., on the 8th day of September, 1908, when they will be opened.

For macadamizing, grading and otherwise improving the road or highway leading easterly from Katonah Village to Cross River Bridge, a distance of about eight-tenths (8-10) of a mile.

Plans may be seen, blank forms of proposals, specifications and other necessary papers can be obtained on application at the office of Joseph E. Merriam, Town Clerk, Mount Kisco, N. Y., or at the office of Byrne & D[illegible] Engineers in charge, White Plains, [illegible], on and after Wednesday, Septem[illegible] 1908.

The Town Board reser[illegible] right to reject any and all bids o[illegible] accept any bid or bids, which in the[illegible] ment may be most favorable to th[illegible] of Bedford.

JOSEPH E. M[illegible]AM,
[illegible] Clerk.

Dated Mt. Kisco, N. Y., A[illegible] 1908.

COMBINED STOR[illegible] AND SANITARY SE[illegible]RS.

Upper San[illegible], Ohio.

Sealed proposals will be re[illegible]d by the undersigned at the office [illegible] Village Clerk of Upper Sandusk[illegible] [W]yandotte County, Ohio, until twelve [illegible] o'clock noon of Tuesday, Septembe[illegible]h, 1908, then and there to be public[illegible] [op]ened and read, for the construction o[illegible] [ab]out 5,275 feet of combined sanitary [a]nd storm sewers, with the necessar[y a]ppurtenances. Size of sewers rang[e f]rom 20 to 48 inches in diameter, tho[se] [3]0 inches and under to be vitrified pipe [a]nd above 30 inches of reinforced concrete, brick, or vitrified pipe.

All proposals to be made on blanks furnished by the village.

Each bidder will accompany bid with a deposit of $2,500.00 or a certified check for like amount, payable to order of undersigned, as a guaranty that within ten (10) days after the acceptance of his bid he will enter into a contract with the Village and execute a surety company bond for an amount equal to 40 per cent. thereof.

Bidders are required to personally look over the work before bidding.

Plans and specifications can be seen and bidding blanks obtained at the office of the undersigned, or from The Riggs & Sherman Co., Engineers, Toledo, Ohio.

The Village Council reserves the right to reject any or all bids.

Dated the 26th day of August, 1908.

A. H. STUTZ,
Village Clerk.

SEWER EXTENSION.

Saranac Lake, N. Y.

Sealed proposals will be received by the Sewer and Water Board of Saranac Lake, N. Y., until 1.30 p. m., Sept. 8, 1908, for furnishing all the material and labor necessary for the construction of about two miles of sewers from six to ten inches in diameter.

Profiles may be seen and form of proposal, contract and specifications may be secured by addressing the Clerk of the Board or the Engineer.

All proposals must be on forms furnished by the Board and must be accompanied by a certified check of $500.00.

The right is reserved to reject any and all bids or to accept any that the Board might consider being to the best interest of the Village by so doing.

SEAVER A. MILLER,
Village Clerk,
Saranac Lake, N. Y.

JOHN S. COLLINS,
444 Broadway, Engineer,
Albany, N. Y.

Situations Open

WANTED—Experienced engineer to take charge of water-works pumping plant; one experienced in filtration preferred. Address, giving previous experience, "M. A. 9," Engineering News, New York. 9-1t

Miscellaneous Wants

HAVE ABOUT $3,000.00 to invest in construction work, South or Southwest; experienced superintendent. Address "L. A. 9," Engineering News, New York. 9-2t

FOR SALE

Complete Contractor's Plant
FOR SALE.

Including Air Compressor and [Re]ceiver; Cableways; Boom Derricks; Ingers[oll] Steam or Air Drills; Columns, Blacksmith Shop; Tools; Pipe, etc.

Job just finished. Will sell cheap. Quick buyer will get bargain. Write or call.

SUMMIT CONTRACTING CO., 9-1t
447 Summit Ave. West Hobo[ken], N. J.